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Furnace Design

THE paper read before the Institution of Chemical Engineers, on Tuesday, by Mr. C. Webb, on "The principles of design of modern industrial furnaces," may well be described as a practical man's view of the problems of design. It will be interesting to the theorists as showing the methods by which furnaces are designed in practice, without regard to many of the refinements which the purist might deem to be necessary.

Asked to design a furnace for a given purpose, the chemical engineer of the more academic turn of mind would presumably begin by asking himself how much heat he had to provide. The known thermal properties of the materials would enable him partly to solve that problem, but at the outset he would find it necessary to assume a thermal efficiency for the furnace. Mr. Webb endeavours to calculate this by assessing the heat required for heating the material, the heat lost in the products of combustion and the heat lost by radiation. We submit that this calculation is entirely empirical, because it is necessary to assume from past experience the temperature of the outgoing waste gases, to assume the composition and volume of those gases, even to assume the composition of the heating gas; and it is indisputable that the loss by radiation will not be so constant as Mr. Webb seems to assume in his calculation, for it depends upon the angle of the surface, upon the nature of the surface, and upon the temperature of the surroundings. In many furnaces the loss of heat from the external surfaces is not due to radiation, but to convection, and that is much more difficult to calculate as will be evident from the excellent monograph on the subject by Saunders and Fishenden.

The extent of the heating surface required is not calculable from first principles, if we are to judge by Mr. Webb's examples. He indicates certain "generally accepted approximate rates of heating" for various materials; 30 lb. of iron and steel can be heated per hour by a square foot of heating surface for heat treating, 60 lb. for annealing, and 80 lb. for forging. These are matters of experience and are, therefore, empirical. The academic engineer, therefore, will early find it necessary to abandon any attempt at calculation of furnaces from first principles. Empiricism meets him at every step.

What, again, should be the volume of the combustion chamber? Mr. Webb gives figures ranging from 1.5 to 20 B.Th.U. per cu. ft. per second, according to the conditions of combustion. We are left with the impression that a great deal remains to be done in this field. Audibert, so long ago as 1924 (*Rev. ind. minerale*, *4*, 1-32), pointed out that the heat release obtained by burning powdered coal actually attained at that time was of the order of 4 to 5.5 B.Th.U. per cu. ft. per sec., and that contemporary combustion chambers were much too large so that figures up to 20 to 85 B.Th.U. per cu. ft. per sec. should be attainable. In the modern water-tube boiler the heat release is from 8 to 11 B.Th.U. per cu. ft. per sec.; the Fuel Research Board grid burner has increased this figure to 19; and latterly the Fuel Research Board vortex chamber has attained a heat release of 140 B.Th.U. per cu. ft. per sec.—well in advance of Audibert's laboratory figures.

The dimensions of the heating chamber proper were not discussed in the paper under review, beyond the interesting remark in regard to one of the examples of furnaces illustrating the paper that "the exceptional height of the furnace roof above the slabs (to be heated) is provided in order to take advantage of the radiating power of a considerable depth of flame." It would have been interesting to hear how far furnace design has incorporated to-day the researches upon the physical laws governing the flow of fluids, such as those of Yesmann and Groume-Grjimailo. The writer of the preface to Groume-Grjimailo's book bears witness to the empirical nature of furnace design, and to the attempts made to make improvements by visiting other installations and endeavouring to incorporate what was best in all, with the result (in the words of the writer) that "not infrequently the starting-up of a new furnace was signalised by an acrid meeting of the lodge of sorrow and by expensive reconstruction and loss of product." No doubt the design of the modern furnace as typified by the work of Mr. Webb and his colleagues of 1938 has progressed far beyond that stage, and the starting of a new furnace is no longer an occasion for sackcloth and ashes. Nevertheless, it would appear that there is still a good deal of empiricism in regard to furnace design. Which is only another way of saying that there is room for much engineering and scientific research upon this subject, which plays such an important part in the economic working of many industries.

Efforts to make countries entirely self-supporting, to bolster up trades by adjusting prices so that the weakest member of a group can pay his wages, to restrict the output of the efficient who could employ more labour and sell at lower prices and so increase the productivity of all the rest of the country, seem to me like trying to make water run uphill.

—*Arthur Chamberlain.*

NOTES AND COMMENTS

The Position of Agriculture

WHATEVER favourable conclusions may be drawn from statistics of agricultural production showing that the yield of any particular crop has increased over that of recent years, there can be no denying the fact that the total area of land under cultivation is steadily decreasing. This is by far the most important consideration affecting the future of agriculture. Particularly at the present time, when the need for pushing the output of home agricultural produce up to the maximum economic limit was probably never more urgent, it is unsatisfactory to notice the ever-growing area of non-productive permanent grassland. Obviously the former does not work the land more fully, for the simple reason that it does not pay him to do so. The lime and basic slag subsidies of the Land Fertility Scheme have been very favourably received by farmers, and, as we have pointed out on more than one occasion, this is definite encouragement for the extension of the subsidy scheme, which should, in any case, give equitable treatment to the manufacturers of all the commonly-used fertilisers.

Need of an Agricultural Policy

WHILE it is not suggested that the financial support of the Government should be used to make a rapid and totally uneconomic increase in home agricultural production, the present tendency must be checked. This can only be done effectively by means of a planned, long-term policy. Any such policy for agriculture is, at the moment, conspicuous by its absence, and the Ministry of Agriculture has been severely criticised on this score. In this connection, it is interesting to note the two resolutions passed at a recent meeting of the Council of the Fertiliser Manufacturers' Association. The first, to the Minister of Agriculture, states that the Association views with increasing alarm the present deplorable position of British agriculture. It welcomes the recent declaration of policy issued by the National Farmers' Union and urges the Government to take immediate action on the lines indicated therein, so that agriculture may be placed on a stable and profitable basis. This, in the opinion of the Association, is necessary from a national point of view and vitally important from the aspect of defence. The second resolution, to the National Farmers' Union and Farmers' Unions of Scotland and Northern Ireland, expresses the Council's wish to support, wholeheartedly, the efforts being made by the National Farmers' Union to impress upon the Government the necessity for taking immediate action.

Smoke Abatement

JUDGING by the number of references which have been made recently in public to the need for reducing atmospheric pollution, there seems to be a growing body of feeling that all is not well with the state of the atmosphere. Yet the report on the investigation of atmospheric pollution for 1938 does not show any marked change in the records of pollution as compared with previous years. The annual report of the National Smoke Abatement Society shows that it has had a year of increased activity and has created two new advisory regional committees so as to stimulate further interest in smoke abatement. Further, the report states " it is interesting to note that complaints about nuisances have become more numerous than they used to be." It would thus appear that the public is alive to the dangers of atmospheric pollution, but little is done by the individual to prevent it. Perhaps the root of the matter lies in the lack of a definition " smoke " in the Public Health Act, as pointed out by Dr. Wilson at the annual conference of the National Smoke Abatement Society. There was, he added, wild confusion and deplorable lack of standards in the English law relating to smoke abatement. Scientific investigations on the cause and cure of atmospheric pollution have been carried out for some time. The Department of Scientific and Industrial Research is undertaking work at the Fuel Research Station into means of eliminating the emission of smoke, grit and sulphur into the atmosphere, and the Atmospheric Pollution Research Committee is surveying the problem. The industrialist already has his scrubber or precipitator and the householder his smokeless fuel. But as the law stands to-day, only rarely is he made to use them.

Signs of Trade Recovery

SIR JOHN SIMON, the Chancellor of the Exchequer, has been telling the National Union of Manufacturers that there are signs of trade recovery. He regards the recent increase in the wholesale price of non-ferrous metals as significant of the wider reactions of trade. These prices, starting from the low level of 88.3 in June, have climbed month by month until they reached the figure of 99.8 in October. Another encouraging sign is the increase in industrial activity in the United States. This, according to Sir John Simon, is more than a revival of the stock and share markets as it represents an industrial quickening which is bound to have repercussions on world trade. Another sign from which he draws encouragement is the high level of British retail trade, his figures showing that daily retail sales have increased by about 2½ per cent. in 1938 as compared with 1937. The Chancellor of the Exchequer's hopes and fears about the progress of trade have a far greater importance than those of other Ministers, as the Budget calculations which he is beginning to make for next year would be rudely upset if his analysis proved to be incorrect. So traders may claim that in a supremely difficult time their efforts to maintain confidence have been successful.

The Five-Day Week

OUR announcement of the twenty-first anniversary of the five-day week, which will be celebrated by Benn Brothers, Ltd., the proprietors of THE CHEMICAL AGE, next April, has brought a number of interesting letters to the company. Firms already working on this basis are almost unanimous as to its advantages, for the small increase in wages costs is usually offset by improved output due to the better health of the workers. Thus a well-known engineering firm writes from Gloucester to point out that, since their manufacturing side closed entirely on Saturdays, " the output of the company has been larger than at any previous time in its history." Besides improved health, another factor is the increased happiness which comes from a free Saturday, with its opportunities for a fuller life. As the chairman of another big concern states " there is no greater single factor tending towards efficient production than the contentment of the staff." This, in turn, leads to fewer changes in *personnel* and so the firm gets longer service from its experienced workpeople. We are hoping to hear from still more readers on the subject, whether their experience has been favourable or not.

The Chemistry of Vitamins*

By
R. GORDON BOOTH, B.Sc., Ph.D.

ISOLATION of a number of the vitamins in a chemically pure state has revealed the fundamental inaccuracy of the name vitamin, the term coined by Funk to express the belief current at that time, that the so-called accessory food factors of Hopkins were complex amines. It is now known that none is an amine though some do contain nitrogen. The alphabetical nomenclature of the vitamins has not yet outlived its usefulness, and is a useful general basis on which to work.

Vitamin A, the principal functions of which include growth promotion and maintenance of resistance to disease, is an unsaturated aliphatic alcohol, characterised by possessing a β-ionone ring. It can be formed in the animal body by derivation from some carotenoids, but while its formation from β-carotene involves simple fission and hydration of the molecule, this has not been found possible to accomplish *in vitro*.

The unsaturated nature of the vitamin renders it chemically very active—it is easily oxidised, oxidation involving numerous simultaneous reactions and a final increase in molecular weight. Its alcohol structure allows of esterification and this property is particularly valuable in relation to its physiological functions. It also readily forms additive compounds with proteins, of which rhodopsin or visual purple is an outstanding example.

Vitamin A is fat-soluble, and usually associated with fats in nature from which it can be obtained in more concentrated form by hydrolytic procedures. It can be separated from its carotenoid precursors by the phase separation test, or by selective adsorption means. Vitamin A is colourless or nearly so; whereas its precursors, the carotenoids, are intense pigments.

Methods of Vitamin A Measurement

Measurement of vitamin A can be made by three fundamentally different methods:—(1) Its growth promoting effect on experimental animals; (2) its absorption in the ultra-violet at 328μ; and (3) its characteristic colour reactions with halides of certain heavy metals.

Vitamin A2, found principally in fresh water fish, is another form of the vitamin with quite different U.V. absorption characteristics from vitamin A1.

Vitamin B1 is a quaternary base, known chemically as aneurin or thiamin. It has a molecule characterised by its possession of the pyrimidine and thiazole rings; the possession of the latter renders it unique among naturally occurring organic compounds. Thiamin is water-soluble and is very much more stable in acidic than in alkaline solution. Its behaviour on titration with alkali is peculiar—after the addition of one mole of alkali, the pH of the solution does not rise steadily with further additions of alkali. But the aneurin does not behave like a buffer because the pH rises at the time of addition of more alkali, but returns to its original level after a few minutes. This occurs as a result of the rearrangement of the molecule, the thiazole ring finally opening on the addition of a final mole of alkali. The addition of acid leads to the reformation of the aneurin. This behaviour is quite unique, and is yet imperfectly understood.

Another rather unexpected reaction is that neutral sulphite solution, in the cold, irreversibly splits aneurin into derivatives of its two constituent nuclei. Oxidation of thiamin gives rise to thiochrome, a biologically inactive fluorescent compound.

The function of thiamin in the animal economy is particularly concerned with carbohydrate metabolism. Deficiency of it leads to the breakdown of the normal processes by which glycogen is broken down to lactic acid with pyruvic acid as intermediary. The break-down occurs at the pyruvic acid stage, and leads to the inability to oxidise pyruvic acid and further with the result that it accumulates in the tissues—particularly in brain and nerves. The measurement of quantities of aneurin present in food sources is almost entirely confined to biological methods though some little success has been obtained in coupling aneurin with diazo compounds to produce a pigment.

Occurrence and Properties of Vitamin B2

Vitamin B2 is frequently associated with vitamin B1 in nature, but is quite distinct in chemistry and properties. Chemically it is a flavin, found in richest sources in yeast, egg white, milk, etc., and is characterised by an intense yellowish-green fluorescence. It is water-soluble, and like thiamin, is very much more stable in acidic than in alkaline solution. It is not readily oxidised, but is destroyed quite easily by ultra-violet radiation and by treatment with alkali. Its physiological function appears to be that of an oxygen carrier, and in this connection it is a component part of the Warburg and Christian enzyme, which latter is the phosphoric ester of vitamin B2, coupled with a protein molecule.

For a long while vitamin B2 deficiency was held to be the cause of the disease pellagra or black tongue, but while such deficiency is probably a contributory cause, it has been shown that pellagra is in fact not due to vitamin B2 deficiency. Chronic vitamin B2 deficiency of long duration appears to cause cataract to develop.

Vitamin C (*l*-ascorbic acid) is the simplest of the vitamins in chemical composition, and the disease of scurvy to which lack of vitamin C gives rise has been recognised as a clinical entity for many years. The biological activity of ascorbic acid depends upon spatial arrangement—*l*-ascorbic is biologically active, whereas the dextro form is not. The most outstanding characteristic of ascorbic acid is the ease with which it can be oxidised and reduced. Vitamin C can be reversibly oxidised by methylene blue, indophenol dyes, nitric acid, hydrogen peroxide, iodine, etc. This property is made use of in the measurement of vitamin C, as it reduces 2:6:dichlorophenol indophenol to the leuco form, and direct titration can therefore be employed in acid solution. Reversibly oxidised vitamin C (dehydro-ascorbic acid) can be readily reduced to give vitamin C again by means of hydrogen sulphide or glutathione. Vitamin C being water-soluble, cannot be stored in the animal body for long, and hence regular supply is essential, such supply being most readily obtained in fresh fruit and vegetables.

Vitamins D2 and D3

The vitamin D situation is progressively becoming more involved, owing to the discovery that there are great numbers of substances which possess a vitamin D effect in the animal, but for all practical purposes one can consider that calciferol (irradiated ergosterol or vitamin D2) and irradiated 7:dehydro-cholesterol (vitamin D3) are typical of the two broad classes into which the vitamins D fall. The former vitamin is usually prepared in the laboratory by ultra-violet irradiation of ergosterol, which is essentially a plant product, while the latter is found in nature in animal and fish tissues in both precursor and vitamin form. Thus it has been customary to refer to vitamin D2 as "synthetic D," and vitamin D3 as "natural D." Though these two vitamins are of equal efficiency in the animal in promoting absorption of minerals, such is not the case so far as birds are concerned, when the latter is up to 20 times as efficient as the former.

Both ergosterol and 7:dehydro-cholesterol are colourless and generally speaking very stable substances possessing

* Synopsis of a paper read before the Hull Chemical and Engineering Society.

strong absorption in the ultra-violet. The irradiation of them can give rise to yields of up to 50 per cent. of vitamin.

Work has recently been carried out on the molecular distillation of vitamin D, which confirms the previously held view that vitamin D as found in nature is a mixture of various antirachitically active sterols, and not pure 7:dehydro cholesterol.

No chemical or physical method has been evolved for the measurement of vitamin D, and it seems unlikely that such a method or methods will be found in the near future. The only methods available are biological ones, depending on the "promotion of mineral absorption" qualities of the vitamin. The amount of prevention or cure of rickets in experimental animals constitutes the basis of such methods.

Knowledge concerning vitamin E or the vitamins E is still in the relatively rudimentary stages. It is known, however, that these vitamins are sterols, tocopherols to be more exact, and are very much too easily oxidised to allow work on them to proceed very satisfactorily. The vitamins E are associated with fertility, and deficiency of E gives rise to permanent sterility in the case of the male, and temporary sterility (resorption of the fœtus) in the female. Two of the most commonly recognised sources of vitamin E are wheat germ oil and lettuce oil, but distribution studies are difficult owing to there being no really reliable method of assay.

Human requirements of the different vitamins vary markedly with age, and general nutritional status of the individual. The growing child requires a very much greater quantity per unit of weight than the mature adult. At this point, however, one enters into a different realm—that of nutrition and public health in relation to economic circumstances, into which field I do not propose to make an excursion.

Lead Fumes and Dusts

Determination and Identification — Two American Publications

Two booklets entitled, respectively, "Determination of Lead in the Air" and "Identification of Industrial Dusts" have been issued by the Air Hygiene Foundation of America, Inc., Pittsburgh, Pa.

In the first booklet it is explained that lead dusts, fumes, and mists may be dispersed in air when using or processing lead, its alloys, or compounds. Some commonly-recognised sources of lead contamination are spray painting or enamelling, battery making, rubber compounding, the preparation and use of lead pigments, the smelting of lead ores, and other processes requiring the agitation of molten lead surfaces. Other sources exist, and wherever lead is used in any form, the possibility of air contamination by its dusts or fumes should be considered.

Details are given of the collection of dust samples from suitable volumes of air and of analytical procedures found to be satisfactory for routine determinations of lead in collected air samples, such as by the volumetric method (Fairhall's chromate) and the colorimetric (dithizone) method.

In the second publication it is pointed out that the identification of industrial dusts is accomplished best by using petrography as the basis of analytical work and supplementing it wherever necessary with chemical determinations. Any information relative to raw materials and processes will facilitate the analysis. Detailed practical procedure is given.

THE newly built factory of the Zorka Company at Sabac (Jugoslavia) has commenced production. With about 1,000 employees the factory will produce chiefly sulphuric acid, superphosphate and copper sulphate. It is also intended, under Government auspices, to develop the Sabac region as a centre of chemical industry and mining. Among the projects under consideration is the establishment of an antimony smelting works with a throughput of 18,000 tons.

SO_2 Bleaching of Wool

Effect of pH on SO_2 Take-up and Bleaching Power

THE bleaching of wool with sulphur dioxide and solutions of sulphites has been investigated by Phillips (*J. Soc. Dyers and Colourists*, 1938, *54*, 503-512). The take-up of sulphur dioxide from solutions of varying *p*H, together with the bleaching power of these solutions, were determined.

"Bound" dioxide was measured by distilling the treated wool sample with phosphoric acid solution of *p*H 2-3 (1 cc. of pure acid to 500 ccs. of water), the evolved SO_2 being determined iodometrically. Preliminary experiments had shown that under these conditions the amount of dioxide evolved was a maximum. The free sulphur dioxide (*i.e.*, that not combined with wool) was determined by distilling the wool with concentrated hydrochloric acid. The total sulphate was obtained by dissolving the wool in HCl and precipitating with barium chloride.

The behaviour of the SO_2-treated wool when distilled seems to support the claims of other authors that the dioxide combines mainly with the cystine units, a combination which Clarke has shown involves the production from each disulphide group of one thiol (SH) group, and one $-S.SO_2Na$ residue. This latter group is hydrolysed when distilled, either to $SH + NaHSO_4$ (at *p*H's less than 2), in which case no sulphur dioxide will come off at all, or else to $-S.OH + NaHSO_3$ (at *p*H's above 2), in which case all the combined SO_2 will be evolved provided the solution is acid enough, as it is between *p*H's of 2 and 3.

It was found that combination of wool with sulphur dioxide was a maximum at *p*H 5, as also was the production of thiol groups from the cystine linkages. Furthermore, the bleaching power of the solutions reached a maximum at the same point. The numerical values for all these properties fall off very considerably below a *p*H of 3 and above a *p*H of 6.5, in which region titration curves show that the solutions contain the largest amounts of sodium bisulphite. It is presumed, therefore, that it is with bisulphite that the disulphide groups in the wool react, possibly in two stages, thus: $-S.S- + H_2O \rightleftharpoons -SH + S.OH$ and $-S.OH + NaHSO_3 \rightleftharpoons -S.SO_2.ONa + H_2O$.

It is suggested that the natural yellow colouring matter of wool, which is so readily destroyed by the use of sulphur dioxide, is due to the chromophoric nature of the cystine disulphide groups when they become part of a polypeptide molecule, as in keratin, *i.e.*, when they become linked to carbon atoms by double bonds. In this connection it is pointed out that linked sulphur atoms lead to the production of colour in inorganic compounds; the colour of "over-bleached" wool is due to the formation of salts of the atomic thionic acid $H_2SO_3.SO_2$.

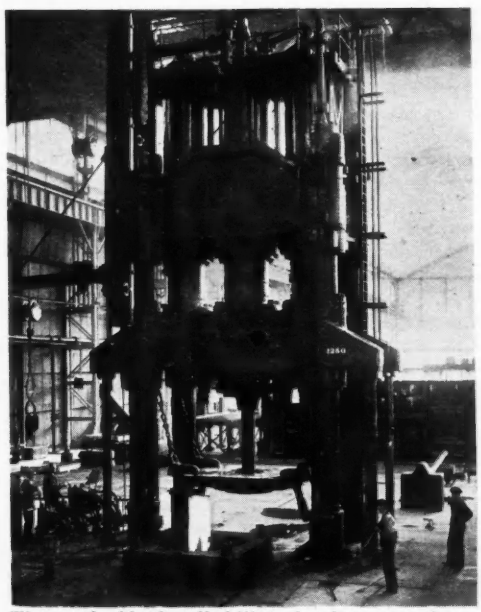
CHEMICAL CLUB

"Unspilt Milk" is the title that Professor H. D. Kay, O.B.E. D.Sc., Ph.D., has chosen for his informal talk to the Chemical Club on Monday next, December 19. There will be a dinner before the talk at 7 p.m. and the talk will commence at about 8.15 p.m., thus giving members and their guests sufficient opportunity to fraternise beforehand. Professor Kay is Director of the National Institute for Research in Dairying at Reading University, and holds a number of other appointments in biochemistry and agriculture. The talks this winter have been fully up to the standard set in previous sessions when the reputation of the Club for outspoken speaking by both lecturer (or rather talker) and his audience have been more than maintained. No reports are published of these talks and it is surprising what a diversity of opinions and experiences are revealed in the confidential atmosphere that obtains. The next talk will be on January 23 (at the same time) and will be by Dr. Olaf Bloch, who has been similarly uncommunicative in his title, which is "Some Undeveloped Pictures."

The Chesterfield Tube Co., Ltd.

Lord Stanhope Opens New Heavy Tube-Making Plant

LORD STANHOPE, First Lord of the Admiralty, officially opened a new heavy tube-making plant, described as of a size and power exceeding any other of a similar kind operating in the world, at the works of the Chesterfield Tube Co., Ltd., on December 8. The new plant has been designed for the manufacture of weldless steel tubular products having a maximum external diameter of 54 inches and an approximate finished weight of 16 tons. The



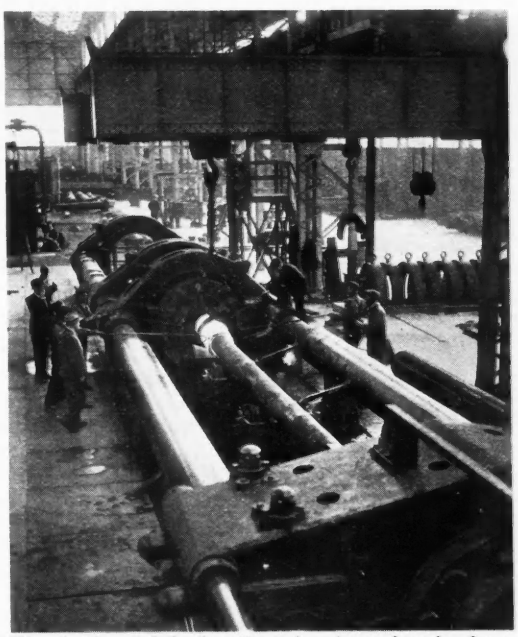
The vertical hydraulic billet-piercing press showing preheated billet being ejected from the matrix of the press after the piercing operation.

maximum length of hollow that can be drawn is 35 feet, but in practice this length will vary according to the wall thickness required in the finished product and the minimum wall thickness which is practicable. Weldless steel tubular hollows within the new range are suitable for many varied purposes, for example, steam pipes for high pressure installations, water and steam drums for boilers, cylinders for the storage of liquefiable and permanent gases, and cylinders for CO_2 convertors. It was pointed out that the new plant is particularly suited for the production of large storage cylinders, drums, pressure vessels and other tubular products designed with one end closed in the form of a solid base, thus enabling the company to offer these speciality products in a greatly increased range of sizes and weights. It is claimed that the operation of the plant ensures that Great Britain is no longer dependent upon foreign sources for the manufacture and supply of heavy calibre pierced and drawn steel hollows.

The new plant is housed in a structural steel building consisting of two parallel bays, one 660 ft. long, 100 ft. wide and 60 ft. high, the other 615 ft. long, 50 ft. wide and 33 ft. 6 in. high, the height in both cases being to the eaves. The covered floor space is nearly 100,000 sq. ft. The plant consists of a vertical, hydraulic, triple cylinder, billet-piercing press of a power to operate on a billet or ingot having a weight of 20 tons. Auxiliary hydraulic cylinders are fitted for moving the container from under the press and ejecting the pierced bloom. The press, which has a total weight of 850 tons, is capable of producing in one operation a hollow forging 9 ft. in length. The horizontal, hydraulic tube draw bench is also of the triple cylinder type, the maximum stroke being 40 ft., and hollow blooms of approximately 20 tons can be mandrel drawn. The draw bench has an overall length of 140 ft. and weighs over 500 tons.

The furnace equipment comprises a bogie tunnel furnace of the multi-pass regenerative type, with a temperature range up to 1,300° C., a soaking pit furnace of the multi-pass regenerative type, designed for a maximum working temperature of 1,300° C., and a recuperative tube re-heating furnace. The furnaces are fired by gas, piped from the coke ovens of local collieries, and the annual gas consumption is estimated at three hundred million cubic feet. The hydraulic equipment for the piercing press and the draw bench consists of three pumps, each driven by a 6,600 volt 3-phase synchronous motor of 600 h.p. The accumulator is of the air hydraulic type, comprising air and water receivers. The pumps are arranged to run continuously when the plant is working; electrically operated valves controlling the supply of pressure water to the accumulator according to the demand from the machines.

At the opening ceremony, a pre-heated steel billet 40 in. across corners, and weighing approximately 18,000 lb., was removed from the soaking pit by a 20-ton overhead crane and carried to the piercing press. Lord Stanhope then pressed a switch, which operated the press, and declared the plant open. After the billet was pierced, it was transferred by a 50-ton crane to the draw bench, where it was positioned on to a draw bar and forced through a series of dies. Finally,



The horizontal hydraulic tube draw bench showing the pierced hollow being positioned on the mandrel bar prior to the drawing operation.

the drawn hollow was lifted by the 50-ton crane, positioned on to a porter bar and charged into a re-heating furnace. The ceremony was concluded by a demonstration of the transference of a pre-heated billet from the furnace to the soaking pit.

Sir William Talbot, chairman of the company, who presided over a luncheon held after the ceremony, proposed the health of Lord Stanhope. Referring to the new plant, he said that the Chesterfield Tube Co. had taken their courage in both hands in constructing this extension, but they looked forward with confidence to its successful operation.

Responding to the toast, Lord Stanhope pointed out that this was his first speech as First Lord of the Admiralty. He said that we in this country were too much inclined to run ourselves down by saying that other countries were ahead of us and we were falling behind. It was time we realised that we were very often in the forefront and ahead of other nations. Those who had seen the demonstration of the new plant, which was finer and bigger than any other of its kind in the world, must have appreciated the truth of this. On behalf of the Government and of the Board of Admiralty he congratulated the company on their foresight and initiative in setting up the new plant. He firmly believed that their financial outlay would be repaid to them in full measure, and wished them all success in their great new development.

Lt.-Colonel S. M. Tate, joint managing director of the company, proposed the toast of "The Visitors," to which Mr. Allan J. Grant, the Master Cutler of Sheffield, and Sir J. A. Aiton responded.

The Mayor of Chesterfield (Councillor S. T. Rodgers), proposing the toast of "The Chesterfield Tube Company," said that in 1907 the works covered an area of 12 acres and employed about 100 men, while to-day the works covered an area of 29 acres and employed 1,500 men. He congratulated the company on their great commercial activities and on the interest taken by the directors in the welfare of their employees.

Applications of Fluorene

Useful Possibilities in Dyestuffs and Analytical Chemistry

THE chemistry of fluorene and its derivatives is the subject of a lengthy contribution by G. Rieveschl, Jr., and F. E. Ray, of the Department of Chemistry, University of Cincinnati, which is published under the auspices of the American Chemical Society in the October issue of *Chemical Reviews*. This contribution extends to 103 pages and is based on a thesis which was submitted by one of the authors (Rieveschl) to the University of Cincinnati as one of the requirements for a higher degree. The thesis was awarded the Henry Hochstetter prize by the Cincinnati Section of the American Chemical Society.

After dealing with the discovery of fluorene and the elucidation of its structure, the authors make brief reference to fluorene and fluorenone and the reduction products of fluorene. They then give general methods of synthesis for the derivatives of fluorene and fluorenone, covering eleven main groups which include derivatives of the type $(C_6H_4)_2C{=}N-$, $(C_6H_4)_2C{=}C<$ and $(C_6H_4)_2C<$; nuclear halogen derivatives; nitro and amino compounds; carboxylic acids; suphonic acids; ketones; fluorene derivatives from highly phenylated compounds; arsenic and phosphorus compounds; and fluorene dyes.

It is stated that although a large number of fluorene dyes have been prepared, no commercial use of them has apparently yet been made. Sircar and Bhattacharya (*J. Ind. Chem. Soc.*, 1931, *8*, 637; 1932. *9*, 521) have synthesised tetrazo derivatives of 2,7-diaminofluorenone by coupling with various intermediates. Dyes similar to those obtained from benzidine were naturally expected, the colour varying from deep brown to reddish violet and bluish violet. Most of these were substantive to cotton. The same authors also prepared a series of azo dyes from 2-aminofluorenone. Novelli (*Anales asoc. quim. argentina*, 1927, *25*, 187) prepared the bis-azo derivative of 2, 3, 6-ntphthaldisulphonic acid and 2, 7-diaminofluorene, the sodium salt being a dark violet substance which dyed wool and silk direct.

Sachs and Oholm (*Berichte*, 1914, *47*, 960) prepared a vat dye from fluorene and 1,2-naphthoquinone-4-sulphonic acid, which gave a variety of mordanted colours. Schaarschmidt and Herzenberg (*Berichte*, 1920, *53*, 1,807) prepared several vat dyes of fluorene which were similar in structure to those of anthraquinone and phenanthraquinone. Mukherjee and Dutt (*Proc. Acad. Sci. United Provinces Agra Oudh*, India, 1935, *5*, 234) condensed aromatic amines and hydroxy compounds with fluorenone to give diphenylene xanthenes which were similar in properties to phthalein dyes. The dyes derived from 2,7-diaminofluorene and 2,7-diaminofluorenone seem to have possibilities in industry, but the present cost of these amines is notably high; fluorene nevertheless, is readily available in commercial quantities when industry can make use of it.

Rieveschl and Ray, in the paper under review, also deal with the use of fluorene and 2.7-diaminofluorene in analytical chemistry, and with the stereochemistry of fluorene.

Ditz (*Chem. Ztg.*, 1907, *31*, 486) was the first to report an analytical use for fluorene. He noticed that on the addition of a weak solution of formaldehyde to a solution of fluorene in concentrated sulphuric acid a blue colour was formed. Attempts to estimate formaldehyde in milk by this method were unsuccessful, because the test was not sufficiently sensitive for minute amounts of formaldehyde. Gugliamelli and Delman (*Anales asoc. quim. argentina*, 1917, *5*, 169) studied the colour reactions produced by fluorene and concentrated sulphuric acid in the presence of various carbohydrates. The test was carried out by adding the sulphuric acid to a mixture of 0.5 cc. of an alcoholic solution or suspension of the carbohydrate and 2 to 3 drops of a 2 per cent. solution of fluorene in alcohol. The colours obtained with glucose, sucrose, α methylglucoside, and especially with arabinose were very characteristic and the test could be used to differentiate these sugars. De Fazi (*Gazz. chim. ital.*, 1924, *54*, 658) later extended this test for detecting traces of various aldehydes.

Gugliamelli and Ruiz (*Anales asoc. quim. argentina*, 1929, *17*, 189) found that 2,7-diaminofluorene hydrochloride could replace benzidine in the precipitation of soluble salts of sulphuric, tungstic, molybdic and chromic acids. They described a quantitative procedure for tungsten. Nino and Calvet (*Anales soc. espaü. fis. quim.*, 1934, *1,932*, 698) worked out a method for the quantitative determination of zinc using the diamine as the precipitating agent.

The Greek Chemical Industry

Increasing Production

A REPORT issued by the Department of Overseas Trade on the economic and commercial conditions in Greece (H.M. Stationery Office, 1s. 8d.) reveals that the chemical industry in Greece is making considerable headway. Favoured by a high protective tariff, the industry has grown rapidly, states the report, and is to-day making the country independent of foreign supplies of many chemical products. The general index of the production of chemicals, based on a figure of 100 for 1928, shows a figure of 146.32 for 1936 and 168.40 for 1937. The number of undertakings was 311 on January 1, 1937, and the principal chemical industries are:—Soap manufacturing (160 factories); chemical fertilisers (the chemical fertiliser industry is represented chiefly by the Société Anonyme d'Engrais et de Produits Chimiques, the most important industrial concern in Greece); dyestuffs (three companies); colophony and turpentine (30 factories); explosives (14 factories); carbide of calcium (one factory); paints and varnishes (eight companies); and pharmaceutical products.

The report adds that in the export of chemical and pharmaceutical products to Greece the United Kingdom is rapidly losing trade to Germany. Practically the whole of Greece's requirements in certain chemicals was formerly supplied by the United Kingdom, but the economic forces brought into play by the clearing agreements have been such as to drive the United Kingdom articles from the market in many instances, *e.g.*, carbonate of soda, and caustic soda.

Recent Investigations on Shellac

Their Influence on Paint, Varnish and Lacquer Technique

AT a meeting of the Borough Oil and Colour Students' Association held at the Borough Polytechnic, London, a lecture was given by Mr. A. J. Gibson and Dr. R. Bhattacharya on recent investigations on shellac with special reference to paint, varnish and lacquer technique. The lecture was accompanied by a film showing the growing and collection of the raw material and its subsequent manufacture in the factory at Calcutta. The chair was taken by Mr. H. L. Howard.

MR. A. J. GIBSON, who is Special Officer Lac Inquiry and controls the London Shellac Research Bureau, gave what he termed a foreword to the lecture. In his opening remarks, Mr. Gibson said the film was shown by permission of the owners, Angelo Bros. (London), Ltd., who had done so much in developing the processes of what were generally known as machine made lac and maintaining lac products as desirable and useful in modern industries.

Continuing, he said that 8½ million-million female lac insects produce yearly in British India some 60,000 to 70,000 tons of sticklac. When worked up into seedlac and shellac the exported products amounted to some 35,000 tons a year, valued at £2,000,000. The industry was virtually a British India monopoly, but about 5 per cent. of the whole output comes from Siam, Singapore and French Indo-China. Lac was a very complex substance and gave lac resins, lac wax, albuminous matter, sugars, a water-soluble dye and an alkali-soluble dye. Originally valued for its dye, which industry was killed by synthetic dyestuffs, lac came into its own through the various uses its resins could be put to in industry.

The Uses of Lac

Speaking of the uses of lac, it was stated that gramophone records use 35 to 40 per cent. of India's exports; electrical insulation 15 to 20 per cent.; paint and varnish industry 15 per cent.; hat stiffening 10 per cent.; sealing wax 5 per cent. The principal advantages of lac, in terms of thermo-physical properties were stated to be that it is a true thermo-plastic resin; is soluble in alcohol and alkali; has a low coefficient of contraction and expansion; makes good films which have strong adhesion and are of good gloss, flexibility and elasticity; and has outstanding electrical and heat insulating properties. The disadvantages, which research is gradually overcoming, were said to be low resistance to water absorption and weathering generally; low softening range; and slow and uncertain thermo-setting properties.

Mr. Gibson went on to say that, with the fate of the Indian indigo industry in mind, the Indian Government in 1921-23 made a thorough inquiry into the lac industry, which was followed, in 1925, by the establishment of the Indian Lac Research Institute. This was primarily concerned with fundamental research and with giving assistance to Indian industries using lac. In 1929, the post of Special Officer Lac Inquiry in London was created, and this officer studies the consumers' views in regard to lac products and their utilisation. He is also responsible for propaganda. In 1933, the London Shellac Research Bureau was formed which, in addition to applied research in lac, deals with trade inquiries and their solution, as well as with improved and new uses for lac products. In 1934 the Government of India sponsored financially lac research in the New York Shellac Research Bureau, which had been working on private funds since 1928. This Bureau is broadly speaking organised on the same line as the London Bureau, close co-operation being maintained between the three research centres in India, London and New York. The research activities have been financed by a small export duty on Indian lac products which produces between £20,000 to £25,000 a year.

DR. R. BHATTACHARYA, discussing the technical aspect of the subject, said that a thin flake of pure shellac has excellent gloss, hardness and elasticity and is unaffected by prolonged immersion in water. A film of shellac obtained from alcoholic solution possesses most of the properties of the original resin, but suffers from the drawback that it is somewhat sensitive to water. Reorientation of the micelles during film formation exposes the hydrophilic groups and components, and this fact together with the solvent retained by the film is responsible for the water sensitivity of the film.

An Improved Type of Lac Resin

Recent research has led to the development of a process for obtaining an improved type of lac resin. By a process of separation, fractions of lac resin possessing higher melting points and reduced solubility in alcohol have been obtained and whole shellac, like all polymerised materials, can thus be looked upon as an isogel. The molecules, though long in shape are by no means straight rods; the internal structure therefore can be compared to that of polystyrene. This structure differs from the polystyrene type of resin and resembles a resin with globular micelles in possessing thermo-hardening properties. The existence of several hydroxyl groups in each molecule act as centres of interlinks between the chains, providing spatial cross linkages which are necessary for gelling and hardening. These hydroxyl groups, contained in the three-dimensional network, provide the material with bonds of large energy content and exhibit high elasticity.

Coming to recent researches and development, it was pointed out that lac research activities have been carried out in recent years principally at the Indian Lac Research Institute, Ranchi; the Brooklyn Polytechnic Institute, New York, and the London Shellac Research Bureau. Entomological, cultivation and production problems are investigated in India, but it was pointed out that unfortunately, so far, sufficient fundamental chemical and physical investigation has not been made on shellac. Perhaps for obvious reasons preference has been given to problems of practical importance and there has been a lack of enough fundamental work. A knowledge of the chemical constitution of shellac is still incomplete, but the progress made in other directions is regarded as satisfactory.

Subject-Matter of Recent Researches

Recent investigations in shellac research include, among other things, the following: The fractionation of lac; lac-drying oil varnish; lac-esters; dry hot spraying of lac without solvents; lac-cellulose lacquers; and shellac mouldings. Referring to the fractionation of lac it was pointed out that ordinary shellac suffers from several undesirable features, more especially from the point of view of the paint, varnish and lacquer industry. These are (a) a comparatively low softening point; (b) rather an acid nature which affects metals such as copper and which reacts with basic pigments; and (c) susceptibility to water blush, which may be due to solvent retention or the presence of hydrophilic low molecular components. The London Shellac Research Bureau fractionated shellac by partial extraction with solvents, such as toluene and trichlorethylene, and found that the insoluble fraction had a higher softening point and superior film-forming properties. Similar fractionation was achieved in India by means of acetone. Later on it was shown that shellac could be separated into two parts by extraction with hot dilute aqueous alkali. It was found that the insoluble fraction had improved properties similar to the resin obtained by solvent extraction. It was pointed out that the properties of the resin cannot be altered beyond a certain limit by a single extraction, but by successive extractions further fractionation

takes place. This hard lac resin, or "Sclerolac" as it is called, is finding uses mostly as a spraying lacquer, as these finishes are comparable to cellulose. Improved electrical properties, non-greening of copper and the higher softening point of this resin may be of interest to the electrical insulation industry, but it has a short life under heat and little or no flow at ordinary pressures and at a temperature of 150° C. It flows, however, under heat and pressure, and therefore can be used as a moulding resin.

Referring to lac-drying oil varnish, Dr. Bhattacharya said that the difficulty of incorporating shellac into drying oils has been overcome by recent research, and means of making oil bearing lac varnish of excellent properties have been found. The method of making shellac oil varnish consists of forming mixed ethers and esters of lac fatty acids and glycerol by heating at a suitable temperature. The colour of varnishes made from ordinary shellac is dark, but paler products can be obtained from decolorised lac and distilled fatty acid. These varnishes can be thinned with the usual thinners and they dry in from 4 to 8 hours. They are suitable as air-drying or baking varnishes, particularly for canning lacquers and they are readily pigmented to give good paints. They are also recommended for a combined knotting and priming coat for wood.

Dry Hot Spraying of Lac

Dry hot spraying of lac was next considered. Apparatus and technique has been developed for spraying shellac in powdered form through a flame. By this means a coating more resistant to water and harder than that of a varnish film is obtained. The spraying can be performed on almost any surface, porcelain, plaster, wood, paper, or metals. So far, a film thinner than 0.1 mm. has not been obtained and therefore the flexibility of the coat is inferior to that of a varnish film. It is thought that this difficulty may be solved by improving the spray gun and spraying operation, thus enabling a number of very thin coats to be applied.

Referring to lac-cellulose lacquers, it was pointed out that resins form an important component of nitrocellulose lacquers. Their functions are to increase the solid content of lacquers consistent with the required viscosities and their gloss and durability. Generally dewaxed and bleached shellacs are used in nitrocellulose lacquers, but the amount of shellac that can be incorporated is limited by the necessity for having a sufficient quantity of alcohol in the solvent mixture in which, however, ordinary nitro-cotton is insoluble. About 40 per cent. of ordinary cotton in butyl acetate or similar solvents can be incorporated into an alcoholic solution of shellac to give a satisfactory lacquer. It is interesting to note that an alcoholic solution of the hard lac resin already mentioned, with a certain amount of plasticiser, even without any cellulose, gives a spraying lacquer which is comparable to cellulose lacquer particularly in furniture finishes.

Finally, Dr. Bhattacharya referred to moulding and the uses of shellac for this purpose. In the production of gramophone records, he said, shellac is still considered the best resin. The recent development in injection moulding may prove to be of great value to the thermo-plastic resins and in shellac, which possesses excellent electrical properties, it was suggested there is a suitable resin for the purpose.

THE CHAIRMAN (MR. H. L. HOWARD) said that an interesting feature shown in the film was the application of shellac in the molten condition, and the manner in which shellac could be sprayed made one wonder whether in the future it would not be possible to spray some cellulose derivative in a similar manner.

MR. W. GARVIE said he had followed the work of Dr. Bhattacharya very closely and it was obvious from the lecture that his fertile brain was evolving a hundred-and-one different ideas on the subject, but it would be much better if he would, perhaps, concentrate on three or four as being the most likely ones because there were certain ideas which were really well worth close investigation; for instance, the use of a humid atmosphere played a very important part in the nature of the shellac as finally produced. It had been said that shellac had five hydroxyl groups, and he would like to know if Dr. Bhattacharya looked upon the shellac molecule as a static or a dynamic thing. It was constantly changing even at room temperature; again, these hydroxyl groups were very loosely associated. The method of spraying shellac which had been described was extremely interesting and Mr. Garvie recalled that at a meeting of the Oil and Colour Chemists' Association some 10 years ago he had suggested that one day all decorative materials would be sprayed and that no solvent would be used. He congratulated Dr. Bhattacharya on having developed the ingenious method described in the lecture and believed it had a great future. There was another method, namely, to force molten lac through a very narrow orifice into a cool chamber so that it formed microscopic globules which solidified before they had had time to cohere giving a colloidal powder of shellac which could be dusted on to a hot surface and form a film of extreme thinness and of very high flexibility. That was actually being used in this country at the present time. There was no limit to the use of natural resins and Mr. Garvie expressed the view that they would come back and largely oust synthetic resins.

MR. C. W. A. MUNDY said that since the hydroxyl groups in the shellac molecule were phenolic hydroxl groups, would it not be possible to react them with, say, formaldehyde for the production of a modified resin having superior properties. There was evidence that it was quite possible to do it in solution and that seemed a very useful field for investigation.

MR. A. F. SUTER said the lac industry had been the cause of another industry, the synthetic resin industry, growing up and ultimately overtaking it. It certainly seemed that as the result of the work which had been described there would eventually be a much wider use of lac which at present was confined more to certain technical purposes. He had always held the view that the use of lac would never die out altogether, although it might die in the form in which it had existed for many years.

MR. W. S. CHORLEY said it seemed a little surprising that, after all the years the lac industry had existed, more attention had not been paid to the drying time, a very important factor.

DR. R. BHATTACHARYA, replying to the point raised by Mr. Garvie whether the lac molecule was static or dynamic, said the molecules were always in a state of vibration and there was always a certain amount of mobility even in the isogel. Therefore it must be taken that the molecules were dynamic. Drying time was an important matter from the point of view of mass production in factories and when it was possible to wait six months probably better results were obtained. In most cases, however, a shorter period was necessary and with some types of goods dealt with the shellac had to be sprayed and finished and packed within 8 to 12 hours. A period of 24 hours was a maximum. The speed of drying was the reason why cellulose was so popular. He agreed with Mr. Garvie with regard to the possibility of forming globules of shellac and had seen it done, and a good film produced.

EXEMPTIONS FROM KEY INDUSTRY DUTY

The Treasury have made an order under Section 10(5) of the Finance Act, 1926, continuing the exemption from key industry duty of certain articles, including scientific instruments and chemicals, until December 31, 1939. The Treasury order, entitled The Safeguarding of Industries (Exemption) No. 6 Order, 1938, has just been published by the Stationery Office. The full list of the chemicals considered by the Board of Trade for the continuation of exemption was published in THE CHEMICAL AGE of September 17, 1938, page 217, and of these only two products, namely, calcium monoiodobehenate and para-phenetidine, have not received continued exemption; the exemptions on ethyl cellulose and methyl cellulose are continued until March 31, 1939, only.

Chemical Matters in Parliament

Oil from Coal

IN the House of Commons last week, Mr. Batey asked the Secretary for Mines whether the extraction of oil from coal at Billingham had been a success or not, and whether he could state the amount of coal consumed per month.

The Secretary for Mines (Captain Crookshank) replied that the Falmouth Committee had carried out an investigation into the working of the hydrogenation process, and he was not in a position to add anything to what was contained in their report, particularly paragraphs 130 to 176. During 1937 the coal consumed at the Billingham plant for hydrogenation and all other purposes was 440,000 tons, or an average of 37,000 tons per month.

Beet Molasses

Mr. R. Gibson asked the Minister of Agriculture whether he was aware that beet molasses manufactured by the British Sugar Corporation was being exported while British yeast manufacturers, requiring molasses produced in this country as best suited for their business, were being compelled to import from the Continent.

Mr. W. S. Morrison stated that he understood that the British Sugar Corporation sold its beet molasses by tender, and that it was the Corporation's practice to accept the highest tender. British yeast manufacturers were, therefore, able to purchase their requirements from the Corporation on at least equal terms with any foreign competitors. The Corporation further state that they have never invited tenders from, or sold molasses to, a foreign buyer, though they did not stipulate that the molasses must be consumed in this country.

Power Alcohol

Major Procter asked the Financial Secretary to the Treasury whether methyl alcohol produced from coal was used in the manufacture of power methylated spirits in this country; and, if so, whether it was charged to duty under the Finance Act, 1938.

Captain Euan Wallace replied that methyl alcohol produced indirectly from coal, so purified or prepared as to be spirits under Section 133 of the Spirits Act, 1880, was used in the manufacture of power methylated spirits in this country and was charged to duty under Section 3 of the Finance Act, 1938.

Major Procter also asked the Chancellor of the Exchequer whether he would state the cost to the Treasury of the allowance of 8¾d. per absolute gallon paid on power and industrial alcohol during the financial years ended March 31, 1922, 1934, 1935, 1936, 1937 and 1938, respectively.

Sir J. Simon replied that the amounts paid during each of the financial years in question on account of the allowance of 5d. per proof gallon payable in respect of power methylated spirits, industrial methylated spirits and spirits used duty-free in arts and manufactures under Section 8 of the Finance Act, 1902, were as follows:—1921-22, £80,000; 1933-34 £563,000; 1932-35, £568,000; 1935-36, £677,000; 1936-37, £743,000; 1937-38, £933,000.

Changes in Duties

In the House of Commons on December 13, Mr. Tomlinson asked the Financial Secretary to the Treasury what representations had been made by any section of the cotton trade to the Import Duties Advisory Committee, by whom, and with what result.

The Financial Secretary to the Treasury (Captain Euan Wallace) stated in reply that he was circulating in the Official Report a list of advertised applications made by

(*Continued at foot of next column.*)

Portugal's Import of Chemicals

Growth in Total Volume and Value—Increased U.K. Share of the Trade

A REPORT on economic and commercial conditions in Portugal, by Mr. A. H. W. King, O.B.E. (Commercial Secretary, His Majesty's Embassy, Lisbon) has been published by H.M. Stationery Office (price, 1s. 6d. net). The report states that imports of United Kingdom goods into Portugal slightly increased in 1937 compared with the previous year, the figures being £3,897,000 and £3,827,000 respectively.

Imports of chemicals into Portugal in 1937 totalled 110,232 tons, valued at £1,062,000. In 1936, 94,323 tons, valued at £877,500, were imported, of which the United Kingdom exported 9,786 tons, valued at £103,500; Belgium, 33,411 tons, valued at £256,400; Germany, 14,143 tons, valued at £167,000; France, 901 tons, valued at £37,600; and Holland, 22,297 tons, valued at £177,000. In 1937 the chemicals exported by the United Kingdom were valued at £143,000, by Belgium, £281,000; by Germany, £162,000; by France, £83,000; by Holland, £130,000.

The principal chemical commodities furnished by the competing nations in 1937 were: United Kingdom: Glycerine, oxide of zinc, oxide of lead, yeasts, silicate of sodium, sulphate of ammonia; Belgium: Carbonate of soda, chloride of lime, lithopones, oxide of lead, caustic soda, sulphate of ammonia, sulphate of potassium, superphosphates of lime; Germany: calcium nitrate, chloride of potash, nitrotoluenes, essential oils, silicate of sodium, sulphate of ammonia, sulphate of potassium, sulphocyanide; Holland: Starches, dextrines, glycerine, essential oils, sulphate of ammonia, superphosphates of lime; Chile: nitrate of soda; Norway: chlorates of sodium; and Poland (Danzig): sulphate of ammonia.

The report also states that the production of cement in Portugal is in the hands of concerns which are able to supply the whole of the domestic market, with the exception of a small quantity of special cements, and that the production of turpentine and resins has increased considerably since 1931. Portugal also produces superphosphates, sulphate of copper, sulphuric acid and soap.

(*Continued from previous column.*)

organisations related to the cotton trade. (The list included applications by the Allied Association of Bleachers, Dyers, Printers and Finishers for gum arabic (Exemptions No. 8, Order, 1938), gum tragacanth (Exemptions, No. 8, Order, 1933), queacitron bark extract (Exemptions, No. 8, Order, 1934), dextrine (farina) (no recommendation made), magnesium sulphate (no recommendation made), oxalic acid (Exemptions, No. 1, Order, 1936)).

Calcium Carbide Imports

In the House of Commons on December 13, Mr. Sexton asked the President of the Board of Trade the total weight and total value of calcium carbide imported into the United Kingdom for each of the last three years. In reply Mr. Stanley said that in 1935, 1,105,000 cwts. of calcium carbide, valued at £606,000, were imported into the United Kingdom; in 1936, 1,112,000 cwts., valued at £613,000; and in 1937, 1,270,000 cwts., valued at £690,000.

Mr. Sexton: Realising that the raw materials for the manufacture of calcium carbide exist in abundance in Durham and South Wales, and that the man-power is there waiting the opportunity to work, are not the Government prepared to do something to set up manufacture in this country?

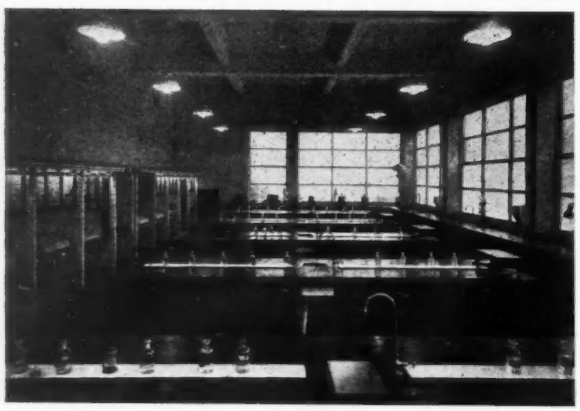
Mr. Stanley: We have made repeated efforts to set up manufacture in this country, but they have not met with the approval of this House.

A New Admiralty Laboratory

Opened by Sir William Bragg at Sheffield

ON Thursday a new Admiralty Laboratory was opened at Sheffield by Sir William Bragg, O.M., K.B.E., President of the Royal Society. The building, which occupies a site of 5,400 sq. ft., adjoins the Admiralty Gauge Factory in Bold Street, and consists of a two-storied steel and red brick structure, with an intermediate floor on one side, and a basement. The layout is on essentially utilitarian lines, and incorporates the latest developments both in construction and equipment. The whole building is served by an air-conditioning system which provides eight changes of air per hour in the chemical laboratories, and four changes in all other rooms. In the former, the air enters through ducts near the ceiling, and leaves through ducts in the fume cupboards, which are connected to a motor-driven extraction fan situated in a chamber at the top of the building.

Windows, which face S.E., run the length of the steel laboratory and extend from bench level to a height of 8 ft. The panes in the lower half consist of Thermolux glass which provides insulation from the heat and glare of the sun.



A view of the laboratory for non-ferrous analysis.

On the opposite side of the laboratory are seven fume cupboards. The walls and the fume cupboards are built of egg shell mottled glazed fireclay blocks. The benches have teak tops and are fitted with cupboards, drawers, white glazed sinks, taps for gas, water, and vacuum supply, and plugs for electrically-heated hot plates, muffle furnaces, and other apparatus. The flooring material is red acid resisting asphalt, which is rounded off at the junction with walls, benches, and other fixtures to simplify cleaning. General artificial illumination is provided by eight 200 watt lamps with Benjamin Glassteel diffusers suspended from the ceiling.

The balance room adjoining the laboratory contains, in addition to the usual balance room equipment, apparatus for the determination of carbon in steel.

The non-ferrous laboratory, and the adjoining balance room, are equipped primarily for the chemical analysis of non-ferrous metals and alloys. Its construction and layout are similar, generally, to those of the steel laboratory. The adjoining balance room, which is very commodious, contains a modern micro-balance, 12 analytical and other balances, and an apparatus for analysis by electrodeposition. The latter consists of 16 stands each fitted with a friction driven rotating electrode holder. A single motor-driven shaft supplies the motive power. D.C. current is supplied to the apparatus by two Westinghouse metal rectifiers.

The metallographic and spectrographic laboratory comprises a room for the preparation of specimens for examination, one for the micro-examination of specimens and the evaluation of spectrograms, and a dark room, also a further room, used for the preparation of spark spectrograms. The

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equipment for metallographic work consists of the usual apparatus for the preparation of specimens, a hydraulic press for mounting specimens in bakelite, Vickers' projection, Watson, and other microscopes, Phillip's Metallix X-Ray apparatus, and electrically-heated drying and mounting presses.

The equipment of the spectrographic section consists of three Hilger fully automatic large quartz spectrographs with both arc and spark attachments, three photo-electric microphotometers, three Judd Lewis comparators, a rotating logarithmic W-edge sector, and other accessories.

The heat treatment laboratory is equipped with a "Birlec" furnace, and a Wild-Barfield high temperature atmosphere controlled furnace, both complete with panels for automatic temperature control, a temperature recorder, and time switch. There are also smaller electric heat treatment furnaces, and a gas-fired furnace for melting non-ferrous metals. A high frequency furnace is shortly to be installed.

The combined staff of the laboratory, exclusive of clerks and laboratory attendants, is at present 43, but if necessary it could be increased to 60 without inconvenience. Provision has also been made to permit of another storey being added to the building should circumstances demand it, without any dislocation of work.

Recent Trade Literature

The latest publication of WOOD AND FAIRWEATHER is a booklet entitled "Our Record," which gives details of the firm's range of lamp and vegetable blacks and also the uses for which they are suitable.

A battery of pressure boiling vessels, crystallisation plant, storage tanks and a high pressure autoclave are among the examples of work recently fabricated in the coppersmiths' shops of S. BRIGGS AND CO., LTD. Illustrations of these appear in a leaflet issued by the company.

ROBEY AND CO., LTD.'s latest catalogue, No. G.693, describes the company's extensive range of manufactures in a most comprehensive manner. A wealth of detail is given of mining plant, diesel engines, air compressors, boilers, steam engines, sisal machinery, welded work and alloy castings, and the book is divided into nine sections, each profusely illustrated.

H. T. WATSON, LTD., have been given exclusive selling rights for the Blake double-acting self-oiling piston pump in the chemical industry. Entirely of British manufacture, the machine has machine cut-gears, brass-lined cylinder, stainless steel piston rod and "oil-bath" lubrication. A folder giving details of the specification and prices has been issued by the company.

BARIMAR, LTD., have issued a 32-page booklet which contains numerous illustrations of the way in which various types of broken machinery, in all metals and alloys, have been scientifically welded and accurately machined by the company's process. The illustrations include those of a big cutting and punching machine, a modern power press, a gigantic multiple machine, an 8-ton head of a hydraulic press and a porous condenser casing, before and after welding.

Some years ago the VISCO ENGINEERING CO., LTD., perfected their "R.M." type rotating self-cleaning air filter for small duties. In a new leaflet they describe their patent rotating self-cleaning air filter for large duties. This is of exclusive design, said to be the first of its kind manufactured in England. The standard arrangement consists of a number of filter baskets containing sinuous filter plates of special design, covered by a thin film of "Viscinol." These divide the air stream into thin layers, which, in passing between the plates, take a sinuous path. The dust particles are separated by centrifugal force, flung and retained on the oil-film-covered plate surfaces. Illustrations are given in the booklet of typical applications of "Visco" air filters to different classes of work.

New Technical Books

TEXTBOOK OF ORGANIC CHEMISTRY. By G. H. Richter. Pp. 711. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. 20s.

This book is directed to students who wish to study elementary organic chemistry and gain more than a superficial knowledge of the subject. The descriptive material is limited to a minimum; such necessary information is presented in tabular form. The method of presentation is designed to help the student who has no previous knowledge of organic chemistry to understand the subject, but the amount of material presented is probably more than can be covered in an average one-year course. The electron theory of valency has not been unduly emphasised. This theory seems to be more complex than was formerly supposed, and since there has been some disagreement over certain phases the author thought it wise to avoid an extensive discussion in an elementary treatise. This presentation will do much to acquaint the student with the fundamental problems and essential conceptions of organic chemistry.

SPECTROCHEMICAL ANALYSIS IN 1938. By F. Twyman, F.R.S. pp. 67. Adam Hilger, Ltd. 4s. 4d. net.

This, the latest work on spectrochemical analysis, makes it abundantly clear that despite admirable research lavished on the subject much remains to be accomplished before full recognition is effected in the majority of laboratories of this country. At first sight this tardiness may seem unfortunate, but on subsequent consideration, and after perusal of the present work, it will be recognised that between 1933 and 1938 such strides were made that delay was well worth while. We believe that Mr. Twyman, one of the stalwarts of spectrography, would himself largely subscribe to this conclusion. In any case, he certainly reports excellent progress, and stresses three main points, namely (1) that here is a guide to what has been added to the knowledge of the subject during the past five years; (2) a description in detail of what he considers the best technique at the present time for routine metallurgical analysis, and (3) a summary of what modern physics has to say about the formation and structure of atomic spectra.

It is, of course, assumed that the reader is conversant with the state of spectrum analysis five years ago, but even to the relatively uninitiated there is much of interest and profit to be found, though it may seem like starting at the wrong end.

Chapter 1, page 1 is of the greatest importance in that it makes clear that in 1933 the determination of metallic, and some non-metallic, constituents of a mixture, could be made by the spectrograph to an accuracy of 10 to 15 per cent. of the constituent's weight, whereas now, by replacing direct visual observation of the photographed spectrum by photometry, and using the best methods of radiation production an accuracy four times that mentioned above is obtained. To the analyst struggling with complex separations this will sound very attractive indeed, but it is later shown that " the quantitative accuracy here spoken of is only attainable when the substance to be detected is present in small amount . . . as a general rule one may place it at approximately 4 per cent." In passing it should be mentioned that the word *maximum* needs to be inserted after " 4 per cent.," so that the situation is made perfectly clear. Even with the proviso added by the author, there is, however, much to be said for any chemist making himself familiar with the comparatively easy technique here explained.

We could have wished though that many more examples had been furnished, for it is a fact that clarity of exposition cannot be too manifest in a work of this description. It would seem that if this system of analysis is ever to be all that we believe possible for it to be, a general text book on the lines of Clowes Coleman's well known " Quantitative Analysis " will be needed.

Chapter 3 is especially interesting because it deals with the causes of differences between chemical and spectrochemical analysis. The significant fact is stressed that microscopic heterogeneity is largely the cause, and that the spectrograph is a far more delicate instrument than any chemical one because it singles out minute areas; the chemical method on the other hand averages the whole sample.

Space forbids further consideration of the pages, but we should like to record our appreciation of Chapter 6 by A. C. Candler. This chapter deals admirably with the elements of the atomic spectrum theory.

The book as a whole achieves what it sets out to achieve, namely, the demonstration of the virility of a valuable chemical adjunct.

CHEMICAL ENGINEERING ECONOMICS. By Chaplin Tyler. Second edition. Pp. 241. London: McGraw-Hill Publishing Co., Ltd. 18s. net.

The scope of this book is considerably wider than indicated by its title. It was originally written to assist non-technical executives who hold responsible positions in the chemical and allied industries, because in the opinion of the author these executives needed some knowledge of the nature of chemical engineering if manufacture and sales were to develop on prosperous lines. But it is not only such executives who will find the book helpful; even chemical engineers of long experience should profit by reading it, because there is a considerable amount of concentrated information throughout and the author shows exceptional clarity in dealing with each particular feature. Originally the book was published in 1920, and the subsequent twelve years have seen such tremendous advances in the application of chemical engineering to industry that the present (second) edition is particularly welcome. The proportion of synthetic organic chemicals at the present day, for instance, is five times what it was in 1926; rayon production, to take a typical allied industry, has also increased five-fold. It is therefore evident that a new edition was needed and that the subject of the book is one which must now command the attention of a wide circle of readers—both those engaged in industry and those in practice as consultants, apart from advanced students.

The first two chapters give an outline of the characteristics, scope and magnitude of the chemical and allied industries, with some discussion of " organisation " to show the relationship of the various executives. Subsequent chapters follow in a definite order, commencing with research and development, analysis of a projected scheme for manufacture, plant location, plant design, unit operation costs, fuels and energy, plant operation and control, sales development, cost accounting, and patents, concluding with a special chapter upon the relationship of the chemical engineer to certain aspects of industry. The chapters on plant design and unit operation costs are very informative, even though much of the information is compressed. It is shown how fundamental design is developed, due attention being paid to such questions as schematic diagrams, allocation of space to storage and equipment, provision for expansion, material handling, etc., with further considerations of the distribution of steam and power, fire and other hazards, and the health and welfare of workers. Approximate costs are shown for equipment and for the operation of equipment in three typical chemical engineering unit operations, namely, filtration, evaporation, and crushing and grinding. Throughout the book there are tabulations and charts to supplement the text where really necessary and without becoming a burden. By comparison with the first edition, the present edition has placed much more emphasis on marketing, organisation, patents, process development, and research; a considerable amount of the statistical material originally included has been omitted.

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Miscellaneous

Chemical resistance of timber. Halls, *Ind. Chem., 14,* 453-454, 483.

Personal Notes

DR. H. B. TAYLOR has been appointed chairman of the Chemical Industry Committee of the Standards Association of Australia.

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MR. C. R. BAILEY, B.A., M.Sc., has been awarded the title of Reader in Chemistry of London University in respect of his post at University College.

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PROFESSOR E. K. RIDEAL, M.B.E., F.R.S., will be the president of the chemistry section at next year's annual meeting of the British Association.

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MR. BENJAMIN DEAVILLE, managing director of Newball and Mason, Ltd., manufacturing chemists, has left estate valued at £80,965 (net personalty £65,750).

MR. J. HEPBURN, director and secretary of the J.P. Tubular Heater Co., Ltd., Newarthill, has been appointed commercial manager of Davidson and Co., Ltd., engineers, Sirocco Works, Belfast.

OBITUARY

MR. W. S. GILLES, former research chemist at the Bocking (Essex) silk factory of Courtaulds, Ltd., died recently.

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MR. JAMES WILLIAM MCROBERT, a director of Cerebos, Ltd., and the Middleswick Salt Co., Ltd., died last week at the age of 71.

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MR. WILLIAM LENNIE AIM, formerly head of the firm of W. L. Aim and Co., paint manufacturers, Glasgow, died at his house recently.

The six prominent business men who have been selected by the Government to serve on an industrial advisory panel on re-armament include, from left to right: Mr. Peter F. B. Bennett, a director of Imperial Chemical Industries, Ltd., and president of the Federation of British Industries; Mr. Francis D'Arcy Cooper, chairman of Lever Brothers and Unilever, Ltd.; and Sir George Beharrell, chairman of the Dunlop Rubber Co. and past president of the Federation of British Industries. Mr. J. S. Addison, managing director of Courtaulds, Ltd., and a director of Samuel Courtauld & Co., Ltd., is one of the three other members of the panel.

PROFESSOR G. M. BENNETT, M.Sc., Ph.D., Professor of Organic Chemistry at King's College, London University, has been admitted a Fellow of Queen Mary College, London University.

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PROFESSOR J. C. DRUMMOND, Professor of Biochemistry at London University, has been appointed chairman, and MR. A. L. BACHARACH, honorary secretary, of the newly-formed Nutrition panel of the Food Group of the Society of Chemical Industry.

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MR. ADOLPH BREGMAN, who has been executive secretary of the Masters' Electro Plating Association of New York since 1934, has now opened a consulting practice in New York City, where he will specialise on industrial problems for the metal finishing trades.

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MR. FRANK PHILIP BOWDEN, M.Sc. (Tasmania), Ph.D. (Cantab) and MR. BRYNMOR JONES, D.Sc. (Wales), F.I.C., have been awarded 100 guineas each by the administrators of the Beilby Memorial Fund—the presidents, treasurers and secretaries of the Institute of Chemistry, the Society of Chemical Industry and the Institute of Metals respectively. Dr. Bowden is Director of Studies and College Lecturer at Caius College, Cambridge University, and the Humphrey Owen Jones lecturer in physical chemistry. His work in electrochemistry has been mainly on over-potential and the mechanism of electrodeposition. His other work on the physical properties of surfaces has an important bearing on the problems of friction, lubrication and wear. Dr. Jones has been responsible for devising many methods in metallurgical analyses. His outstanding published work has been on the subject of the nitrogen-hardening and on the heat-treatment of steels, which has appeared in the Transactions of the Iron and Steel Institute. In 1933, he was awarded the Carnegie Gold Medal of the Iron and Steel Institute for his paper on the nitriding properties of chromium and austenitic steels.

TO-DAY'S ANNIVERSARY

HERMANN WILHELM VOGEL, who died on December 17, 1898, made an important discovery for the photographic industry. In 1873 he discovered that "sensitisers" could be usefully employed in photography to act as an absorbent for the light rays, although not actually taking part in the photo-chemical reaction. This discovery ultimately resulted in the production of panchromatic photographic plates, where by the addition of suitable dyes the silver halide, which is sensitive chiefly to rays of short wave-length, may be made equally sensitive to light of long wave-length. Vogel, born in 1834, was professor of photography at the Technical High School, Berlin.

Foreign Chemical Notes

Norway

THE NORSK HYDRO-ELEKTRISK KVAELSTOF A.S. has put into operation at Herova a mixed fertiliser factory with an annual output capacity of 36,000 tons.

Finland

AT VIEKKA, NEAR PIELISJAING IN EASTERN FINLAND, arrangements have been made for working molybdenum ore deposits by the O.Y. Vuoksenniska A.B.

FORMATION IS ANNOUNCED IN HELSINGFORS of Tähkä and K.ni O.Y., with a share capital of 200,000 Finnish marks, to engage in the manufacture of chemicals and other products.

Sweden

APPLICATION OF THE DUBBS CRACKING PROCESS to the extensive shale oil deposits (the most important of which are in the province of Nerike) would lead to a considerable improvement in the yield of volatile fractions. Preliminary experiments showed an average yield of 30 per cent. benzine by cracking whereas only 7 per cent. of light oils result from the method of fractional distillation hitherto employed in Sweden.

General News——From Week to Week

I.C.I., LTD., has made a gift of £1,000 to the Melbourne University Engineering School rebuilding appeal.

THE ANNUAL MEETING OF THE BRITISH ASSOCIATION will be held next year in Dundee, from August 30 to September 6, under the presidency of Sir Albert Seward, F.R.S.

AN INCREASE OF 4s. 6d. a ton on sugar beet contract prices in Scotland for the next year has been awarded by the Sugar Commission. This will make the price 45s. 6d. a ton.

ANDERSON GYPSUM PRODUCTS, LTD., is about to commence production in Nottinghamshire. The new company will raise gypsum from its own mine, and has erected a modern calcining plant to supply the latest types of plaster.

INTERNATIONAL TECHNICAL DEVELOPMENTS, LTD., of Thames House, Millbank, S.W.1, inform us that they are looking after the interests in this country of the concrete storage tank business of La Paroi Hydraulique. These tanks were described in THE CHEMICAL AGE of November 19, 1938, page 393.

GATESIDE WORKS, BARRHEAD, the first factory in Scotland which will manufacture glacé kid from goatskins, was opened on December 12. The works, formerly owned by the Calico Printers' Association, were acquired three months ago by the Barrhead Kid Co., and cover an area of 11 acres.

HAVING DISPOSED of the whole of their property at 2 and 4 Green Street, London, E.C.2, to the London County Council for site improvements, Wm. Burton and Sons (Bethnal Green), Ltd., are transferring their business, as and from Monday, January 2, 1939, to 9-17 Walter Street, Bethnal Green, London, E.2. Their telephone numbers at the new address will be unchanged, viz., ADVance 2143 and 2144.

KINGS PATENT AGENCY, LTD., of 146a Queen Victoria Street, London, E.C.4, who, last year, published the first edition of their "Inventors and Patentees" Diary, have now published a revised 1939 edition. The notes in the new edition have been revised to incorporate amendments made in the Patent Laws during 1938, and include references to the nature of patents, who may apply, the manner of application, opposition to the granting of a patent, sealing the patent, renewal fees, sale and licensing, searches, foreign patents, etc. The price this year is being reduced to 1s. 6d., post free.

THE RECENTLY-RECEIVED REPORT OF THE INDIAN LAC CESS COMMITTEE for the period April 1, 1937, to March 31, 1938, contains details of the personnel of the committee and the sub-committees, a list of important resolutions adopted by the committee in October, 1937, and March, 1938, a brief account of research carried out at the Indian Lac Research Institute, an account of research carried out by the London Shellac Research Bureau and Co-operative Research in England, a synopsis of the projects studied by the New York Shellac Research Bureau of the Polytechnic Institute of Brooklyn, notes on the production of lac during 1937, and on the trade in lac (prices and export trade), and lists of the publications of the Indian Lac Research Institute, the London Shellac Research Bureau and the New York Shellac Research Bureau.

SPONSORED BY THE UNITED KINGDOM GAS CORPORATION, which controls 73 gas undertakings in contiguous groups in various parts of the country, a new gas grid is to be established in West Yorkshire, where a wide variety of industries is located. The scheme involves the linking up of gas undertakings serving nineteen different communities representing a total capital investment of some two million pounds. These systems will be interconnected with 76 miles of high-pressure pipe with trunk lines 18 in. in diameter. As an integral part of the scheme, these areas will be interspersed with huge gas producing and purifying plants of the latest pattern, erected at colliery pitheads to supplement existing sources of gas supply. Erection of the first of these is now well advanced. The scheme is the first of its kind ever to receive Parliamentary sanction and the full scheme envisaged is a vast national programme.

LIEUT.-COLONEL S. J. M. AULD, PRESIDENT OF THE INSTITUTE OF PETROLEUM, speaking at the Institute annual dinner at Grosvenor House, on Monday, said he wondered whether the greatest use was being made by the Government of the very highly scientific and technical professional societies like the Institute of Petroleum. The Government were only too willing to send representatives to the Institute's Standardisation Committees, but perhaps something could be done by asking for direct representation on the Government committees in matters connected with petroleum. There were several cases he knew personally which would unquestionably have been improved by that method. Through specialised organisations like their own it would be possible to concentrate accumulated knowledge and experience not otherwise available.

THE CHEMICALS SECTION OF THE BRITISH INDUSTRIES FAIR in February will again occupy the first site on the left of the Addison Road entrance to the Grand Hall, Olympia. A list of exhibitors in the Section was given in last week's issue, page 455.

GEORGE H. ALEXANDER MACHINERY, LTD., Birmingham, have been appointed sole agents to the Grotelite Co., Inc., Bellevue, Kentucky, to handle the latter's injection moulding machine. The Grotelite injection moulding press has a maximum weight of casting of 6¼ ounces, and a maximum hourly production of 50 pounds.

B.E.N. PATENTS, LTD., will be moving their offices and works, between January 2 and January 14, 1939, from Gorst Road, Park Royal, London, N.W.10, to Hughenden Avenue, High Wycombe, Bucks (telephone: High Wycombe 1630) where they have built a new and larger works adjacent to their associate company, Broom and Wade, Ltd.

OWING TO SLACKNESS OF BUSINESS, between 500 and 600 men ceased work last week at the Acklam rolling mills of Dorman Long, Ltd. The stoppage, the reason for which is understood to be lack of orders and uncertainty regarding steel prices, will probably be only temporary. The blast furnaces and coke ovens are continuing to operate.

THE ANGLO-IRANIAN OIL CO. has announced that exploratory drilling carried out by its subsidiary, D'Arcy Exploration Co., near Broseley, Shropshire, has indicated that the oil prospects in that area are "definitely unfavourable." The company has consequently relinquished its prospecting rights over an area of 136 square miles in Shropshire and Staffordshire.

THE TEXT OF THE INTERNATIONAL AGREEMENT modifying the International Convention of 1920 for the establishment of an International Institute of Refrigeration has been published by H.M. Stationery Office, Cmd. 5889, price 4d. Of the 43 contracting parties of 1920, 32 have signed the new agreement of May 31, 1937, and, so far, eight have ratified it and one other has acceded to it.

AT BOLTON (LANCS.) COUNTY COURT on December 7, the liability of Waller and Riley, Ltd., manufacturing chemists, Bolton, for an injury sustained by an employee was terminated by an offer of £140 in settlement. It was stated for plaintiff, that his right thumb was severely injured by being trapped between a barrel and a stillage. For some time it was thought he would lose the grip of the hand altogether. Defendants had offered £140 in settlement, and as there was medical evidence that the plaintiff's grip was likely to be completely restored, acceptance of the offer had been advised.

ACCORDING TO THE "BOARD OF TRADE JOURNAL" of December 8, Poland has issued an order effective from November 1, 1938, to April 30, 1939, laying down revised lists of goods which may be imported into the country free of duty or on payment of reduced duties fixed at specified percentages only of the normal rates of customs duty. A number of chemical products are affected by the new order which deals with the goods in three sections. List A relates to goods which may be imported under a permit from the Polish Minister of Finance; list B relates to goods which may be imported on the basis of a certificate issued by a Chamber of Commerce in Poland; and list C relates to goods which may be imported without permit or certificate.

THE TREASURY, on the recommendation of the Import Duties Advisory Committee, have made the Import Duties (Exemptions) (No. 6) Order, 1938, (S.R. and O., 1938, No. 1436), which provides for the addition to the Free List of pig iron produced in an electric furnace and containing not more than 0.025 per cent. by weight of phosphorus not more than 0.02 per cent. by weight of sulphur, and not more than 2.5 per cent. by weight of total carbon. The committee report that recently a source of supply has become available of this type of pig iron which, while closely resembling those types of pig iron already exempted, does not fall within the existing Free List descriptions, and they consider that there would be advantage in making this new source of supply readily available to the users.

NEXT YEAR the school leaving age will be raised to 15 under the terms of the Education Act, 1936. Employers who wish to engage children under 15 will then be obliged to obtain from the local education authority an employment certificate for each child whom it is desired to employ. Employment certificates will be granted only to employers who can offer "beneficial employment" to young workers. The Act leaves the task of assessing "beneficial employment" to the local education authorities. Employers, however, wish to know as precisely as possible what benefits they will be expected to offer if they wish to engage children under 15. Realising this, the British Association for Commercial and Industrial Education appointed a committee to consider the probable effects of the "beneficial employment" clauses of the new Act, and its findings are now set forth in a report, "The Employer and the new Education Act," published by the B.A.C.I.E., at 1s. 0d.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

MANUFACTURE OF NON-METALLIC RESISTANCE MATERIAL.—Ges. zur Verwertung Chemisch-Technischer Verfahren, A.-G. (Germany, Nov. 29, '37.) 33964.

REDUCTION OF OXIDES OF METALS.—J. P. Fraser. 33963.

PROCESS FOR THE COMMON HYDROGENATION OF DISTILLATION, ETC., PRODUCTS OF COALS.—M. Stinnes Gewerkschaft. (Germany, Dec. 13, '37.) 33908.

MANUFACTURE OF PHTHALOCYANINES.—I. G. Farbenindustrie. (Germany, Nov. 20, '37.) 33715; (Germany, Dec. 30, '37.) 33716.

MANUFACTURE OF WOOL DYESTUFFS of the anthraquinone series. I. G. Farbenindustrie. (Germany, Nov. 24, '37.) 34114.

MANUFACTURE OF LAKE PIGMENTS.—Imperial Chemical Industries, Ltd. (United States, Nov. 17, '37.) 33472.

INSECTICIDAL, ETC., SULPHUR PREPARATIONS.—H. L. Leech. 33902.

SOAP, ETC.—Lever Bros., and Unilever, Ltd., R. Thomas, and H. B. Oakley. 33915.

PROCESS FOR THE CONVERSION OF HYDROCARBON OILS.—A. L. Mond (Universal Oil Products Co.). 33492.

ALKYLATION OF PARAFFIN HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). (May 25, '37.) 34107.

ISOMERISATION OF NORMAL PENTANE.—A. L. Mond (Universal Oil Products Co.). (May 5, '37.) 34108.

PRODUCTION OF CARBON MONOXIDE-CONTAINING GASES.—Power-Gas Corporation, Ltd., N. E. Rambush, A. T. Grisenthwaite, and R. W. Rutherford. 33664.

TREATMENT OF HYDROCARBONS, ETC.—M. Stuart. 34059.

CATALYTIC DECOMPOSITION OF AMMONIA.—P. H. Sykes, and Imperial Chemical Industries, Ltd. 34081.

METHOD OF STERILISING BACTERIA.—V. A. Trier, and Andre (Components), Ltd. 33649.

POLYMERIC AMIDES.—W. W. Triggs (E. I. du Pont de Nemours and Co.). 33621.

GLUTAMIC ACID PRODUCTION.—R. G. Tugwood and Standard Brands, Inc. (Aug. 31, '37.) 33958.

PRODUCTION OF CELLULOSE WOOL, ETC.—Vereinigte Glanzstoff-Fabriken, A.-G. (Germany, Nov. 23, '37.) 33539.

TREATMENT OF RUBBER.—A. Lamme-Vincent. 33793.

PRODUCTION OF AMMONIUM NITRATE.—F. J. Wilkins, and Imperial Chemical Industries, Ltd. 34082.

TREATMENT OF EMULSIONS OF CRUDE TAR.—Woodall-Duckham (1920), Ltd., and E. Arnold. 34049.

CALCINATION OF LIME SLURRY.—N. Ahlmann. 34227.

MANUFACTURE OF GRANULAR SUPERPHOSPHATE.—Aktiebolaget Kemiska Patenter. (Germany, Dec. 1, '37.) 34630.

RUBBER VULCANISATION ACCELERATORS.—W. Baird, G. E. Nettleship, and Imperial Chemical Industries, Ltd. 34920.

COLOURING MATTERS OF THE PTHALOCYANINE SERIES.—E. F. Bradbrook, I. M. Heilbron, J. W. Haworth, D. H. Hey, and Imperial Chemical Industries, Ltd. 34657.

RESINOUS CCMPOSITIONS.—British Thomson-Houston Co., Ltd. (United States, Dec. 1, '37.) 34898.

MANUFACTURE OF AZODYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) 34942.

MANUFACTURE OF FERTILISERS.—J. A. Coombs. 34138.

DETERGENTS, ETC.—J. Crosfield and Sons, Ltd. (United States, Nov. 27, '37.) 34572.

AGENTS FOR ABSORBING CARBONIC ACID.—O. H. Dräger. (Germany, Nov. 24, '37.) 34168; (Germany, Dec. 22, '37.) 34169.

PLASTIC POLYMERS OF HALOGENOBUTADIENES.—E. I. du Pont de Nemours and Co. (United States, Nov. 27, '37.) 34655.

ISOLATION OF MINERALS.—E. I. du Pont de Nemours and Co. (United States, Nov. 30, '37.) 34919.

METHOD OF POLYMERISING A HALOGEN-2-BUTADIENE-1, 3.—E. I. du Pont de Nemours and Co. (March 19, '37.) 34220.

EXTRACTION OF MINERAL OILS with selective solvents.—Edeleanu Ges. (Germany, Dec. 29, '37.) 34185.

SURFACE TREATMENT OF GLASS, ETC.—A. E. Edwards (Naamlooze Vennootschap Maatschappij tot Beheer en Exploitatie van Octrooien). 34881.

CHEMICAL COMPOUNDS.—R. F. Goldstein, and Imperial Chemical Industries, Ltd. 34218.

MEANS, ETC., FOR THE MANUFACTURE OF SYNTHETIC PLASTICS.—M. N. Goswami, and University of Calcutta. 34181.

CONTROLLING SWELLING IN THE CARBONISATION OF BITUMINOUS MATERIAL.—H. J. Hodsman. 34679.

MANUFACTURE OF CHLORINATED FATTY ACIDS.—I. G. Farbenindustrie. (Germany, Nov. 25, '37.) 34182.

MANUFACTURE OF COATINGS, ETC., from polymerised 2-vinylfurane. I. G. Farbenindustrie. (Germany, Nov. 25, '37.) 34261.

RECOVERY OF FATTY ACIDS, ETC., from soaps.—I. G. Farbenindustrie. (Germany, Nov. 27, '37.) 34590.

MANUFACTURE OF AZODYESTUFFS.—I. G. Farbenindustrie. (Germany, Dec. 1, '37.) 34786.

AUSTENITIC STEELS.—Inland Steel Co. (United States, Nov. 30, '37.) 34757; (United States, May 14.) 34758; (United States, Oct. 28.) 34759.

MANUFACTURE OF CELLULOSE ESTERS.—I. G. Farbenindustrie. (Germany, Dec. 1, '37.) 34943.

PROPERTIES OF FABRICS MADE OF RESIN THREADS.—I. G. Farbenindustrie, and W. W. Groves. (April 4.) 34183.

INSECTICIDAL COMPOUNDS, ETC.—Imperial Chemical Industries, Ltd. (Oct. 4, '37.) (United States, Oct, 3, '36.) 34656.

STEEL.—Inland Steel Co. (United States, Nov. 30, '37.) 34367; (United States, May 14.) 34368; (United States, Aug. 15.) 34369.

PRODUCTION OF STABLE, ETC., SOLUTIONS of theophylline, etc., for injections.—Knoll, A.-G. Chemische Fabriken. (Germany, Jan. 15.) 34929.

TREATMENT OF TUNGSTEN CARBIDE, ETC.—R. F. Knowlson. 34876.

MANUFACTURE OF PHOTOGRAPHIC EMULSIONS.—F. Lierg, and O. Czeija. 34753.

PRODUCTION OF SILVER ALLOYS.—Mallory Metallurgical Products, Ltd. (Mallory and Co., Inc.). 34433, 34491.

COPPER BASE ALLOYS.—Mallory Metallurgical Products, Ltd. (Mallory and Co., Inc.). 34434, 34490.

PRODUCTION OF COPPER BASE ALLOYS.—Mallory Metallurgical Products, Ltd. (Mallory and Co., Inc.). 34623, 34624, 34625, 34626.

PREPARATION OF THERAPEUTICALLY USEFUL HETEROCYCLIC COMPOUNDS.—May and Baker, Ltd., A. J. Ewins, and J. N. Ashley. 34621.

MANUFACTURE OF CATALYSTS.—A. L. Mond (Universal Oil Products Co.). 34431.

CONVERSION OF HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). 34811.

PURIFICATION OF ZINC SULPHATE SOLUTIONS.—Montecatini Soc. Generale per l'Industria Mineraria, e Chimica. (Germany, Nov. 27, '37.) 34522.

PRODUCTION OF ANHYDROUS CHLORIDES.—J. E. Pollak (Richardson). 34817.

PRODUCTION OF CORROSION-RESISTANT ARTICLES.—J. E. Pollak. (Richardson). 34818.

CHROMISING.—J. E. Pollak (Richardson). 34902.

PRODUCTION OF CHROMIC, ETC., CHLORIDES.—J. E. Pollak (Richardson). 34903.

PRODUCTION OF SURFACE ALLOYED MATERIALS.—J. E. Pollak (Richardson). 34904.

PRODUCTION OF CHROMIUM.—J. E. Pollak (Richardson). 34939.

BACTERIAL FERMENTATION OF CARBOHYDRATES.—H. E. Potts (Lummus Co.). 34149; 34463.

CHLORINATED RUBBER PRODUCTS.—D. D. Pratt. 34737.

PREPARATION OF CHLORINATED RUBBER PRODUCTS.—D. D. Pratt, and R. Handley. 34738.

UREA FORMALDEHYDE RESIN ADHESIVES.—Resinous Products and Chemical Co. (United States, Dec. 28, '37.) 34166.

POISONED PAINT, ETC.—H. L. M. L. de Savignac. (France, Dec. 22, '37.) 34599.

MANUFACTURE OF CYCLOPENTANO-POLYHYDROPHENANTHRENE COMPOUNDS.—Schering, A.-G. (Germany, Nov. 25, '37.) 34262.

MANUFACTURE OF HIGHLY ACTIVE SUBSTANCES from the posterior lobe of the hypophysis.—Schering, A.-G. (Germany, Dec. 14, '37.) 34415.

MANUFACTURE OF ANDROSTENOLONES, ETC.—Schering, A.-G. (Germany, Nov. 27, '37.) 34416; (Germany, Feb. 4.) 34417.

SOAP.—R. L. Sibley, and Monsanto Chemical Co. 34639.

INCREASING THE RESISTANCE OF SILVER to thermal, etc., stresses. G. Siebert Ges. (Germany, Nov. 24, '37.) 34216.

MANUFACTURE OF ADDITION AGENTS for lubricating oils.—Standard Oil Development Co. (United States, Feb. 12.) 34581.

STABILISATION OF STYRENE.—Standard Telephones and Cables, Ltd., and S. G. Foord. (Dec. 24, '37.) 34774.

INSECTICIDAL, ETC., COMPOSITIONS.—W. J. Tennant (Dow Chemical Co.). 34393.

LUBRICATING OIL.—Texaco Development Corporation. (United States, Dec. 18, '37.) 34362.

PRODUCTION OF CELLULOSE PRODUCTS from viscose.—Vereinigte Glanzstoff Fabriken, A.-G. (United States, Dec. 2, '37.) 34322.

Complete Specifications Open to Public Inspection

PREPARING CALCIUM, STRONTIUM, BARIUM, or lead salts of acid sulphuric acid esters with more than six carbon atoms in the molecule.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 31, 1937. 14393/38.

RECOVERY OF VALUES from zinc concentrates.—American Zinc, Lead and Smelting Co. June 1, 1937. 14734/38.

PROCESS FOR THE MANUFACTURE OF STEEL.—F. P. Mehta. June 4, 1937. 15294/38.

DEPHOSPHORISING OF STEEL.—F. P. Mehta. June 4, 1937. 15295/38.

PREPARING ANTISERUMS and the product thereof.—Western Reserve University. May 29, 1937. 15795/38.

MANUFACTURE OF AROMATIC NITRILES.—E. I. du Pont de Nemours and Co. May 29, 1937. 15947/38.

PRODUCTION OF WATER-SOLUBLE COMPOUNDS of the aromatic series, and the resulting products.—J. R. Geigy, A.-G. May 29, 1937. 15927/38.

MANUFACTURE OF COMPOUNDS of the cyclopentanopolyhydrophenanthrene series.—Soc. of Chemical Industry in Basle. May 29, 1937. 16116/38.

MANUFACTURE OF ARYLIDES of ortho-oxycarboxylic acids and dyestuffs.—Soc. of Chemical Industry in Basle. June 2, 1937. 16240/38.

AVOIDING THE CURLING OF LAMINATED FILMS, foils, or sheets, of which the components shrink by different amounts, especially of films of cellulose hydrate on paper.—I. G. Farbenindustrie. June 5, 1937. 16532/38.

PRODUCTION OF STABLE CONCENTRATED SOLUTIONS of the salts of iodohippuric acid.—Naamlooze Vennootschap Orgachemia. June 3, 1937. 16605/38.

Specifications Accepted with Date of Application

LUBRICATING OILS.—Standard Oil Development Co. May 8, 1936. 495,869.

ELECTRODEPOSITION OF METALS.—A. R. Thomas. March 23, 1937. 496,113.

PRODUCTION OF ORGANIC FERTILISERS.—Wellesley Holdings, Ltd., and C. S. Townsend. April 19, 1937. 495,873.

SENSITISING SILVER HALIDE EMULSIONS.—W. W. Groves (I. G. Farbenindustrie.) April 22, 1937. 496,116.

PROCESS FOR THE MANUFACTURE OF OIL-SOLUBLE ORGANIC-MERCURY COMPOUNDS.—E. Lilly and Co., and M. S. Kharasch. April 22, 1937. 496,117.

PROCESS FOR THE MANUFACTURE OF MOTOR FUEL.—A. L. Mond (Universal Oil Products Co.). April 22, 1937. 496,045.

AQUEOUS SOLUTIONS of detergent agents and compositions comprising the same.—J. G. Evans, and Imperial Chemical Industries, Ltd. April 23, 1937. 496,209.

PROCESS FOR THE MANUFACTURE OF A PURIFIED HARD RESIN from lac or shellac.—A. F. Suter and Co., Ltd., and A. Janser. May 19, 1937. 496,124.

MANUFACTURE AND PRODUCTION OF ADHESIVES.—G. W. Johnson (I. G. Farbenindustrie.) May 20, 1937. 496,125.

MANUFACTURE OF DYESTUFFS of the anthraquinone series.—A. Carpmael (I. G. Farbenindustrie.) May 20, 1937. 496,126.

MANUFACTURE OF PRODUCTS containing nitrogen and sulphur.—W. W. Groves (I. G. Farbenindustrie.) May 22, 1937. 495,964, 495,965, 496,052.

TREATMENT OF CHLORINATED RUBBER and products thereof.—H. Michaelis, jun. May 23, 1936. 495,967, 495,968.

CELLULOSE MATERIAL and a process of preparing it.—I. G. Farbenindustrie. May 23, 1936. 496,130.

WATERPROOFING FIBROUS MATERIAL of animal origin.—I. G. Farbenindustrie. May 23, 1936. 496,131.

WATER-SOLUBLE ORGANIC IODINE COMPOUNDS.—Winthrop Chemical Co., Inc. May 29, 1936. 496,134.

MANUFACTURE OF LACQUERS, films, plastic masses, and the like. Deutsche Hydrierwerke, A.-G. May 23, 1936. 496,135.

BUTYL ALCOHOL-ACETONE FERMENTATION.—C. Weizmann. May 24, 1937. 496,137.

OBTAINING METALS from their ores.—E. Edwin. June 13, 1936. 496,270.

POLYMERISATION OF GASEOUS OLEFINES.—G. W. Johnson (I. G. Farbenindustrie.) May 24, 1937. (Cognate Application, 22324/37.) 496,267.

PRODUCTION OF WATER-INSOLUBLE DIAROMATIC PEROXIDES.—W. H. A. Thiemann (Oosterhuis, A. G.). May 25, 1937. 496,214.

PRODUCTION OF PARAFFIN HYDROCARBONS.—A. L. Mond (Universal Oil Products Co.). May 25, 1937. 496,273.

MONOAZO DYESTUFFS.—W. H. Cliffe, A. H. Knight, and Imperial Chemical Industries, Ltd. May 26, 1937. 496,229.

MANUFACTURE OF SHAPED PRODUCTS from polyvinyl chloride.—I. G. Farbenindustrie. May 27, 1936. 496,233.

MANUFACTURE OF ARTIFICIAL SUBSTANCES resembling rubber.—W. W. Groves (I. G. Farbenindustrie.) May 27, 1937. 496,276.

TREATMENT OF ARTIFICIAL FIBRES obtained from caseins.—Montecatini Soc. Generale per L'Industria, Mineraria, ed Agricola. June 8, 1936. 496,277.

PRODUCTION OF COATINGS of thermoplastic highly viscous products.—I. G. Farbenindustrie. May 28, 1936. 496,240.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. July 2, 1936. 496,241.

MANUFACTURE OF TRIPHENYLMETHANE DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) May 31, 1937. 495,881.

MANUFACTURE OF CELLULOSE ESTERS.—W. W. Groves (I. G. Farbenindustrie). June 7, 1937. 496,065.

PRODUCTION OF ALCOHOLS of the cyclopentanopolyhydrophenanthrene series.—A. G. Bloxam (Soc. of Chemical Industry in Basle). June 17, 1937. 495,887.

MANUFACTURE AND PRODUCTION OF LIQUID HYDROCARBONS from gases containing olefines.—G. W. Johnson (I. G. Farbenindustrie.) June 21, 1937. 495,889.

PRODUCTION OF SALTS OF THIOCYANIC ACID.—O. Bartsch (trading as Chemische Pharmaceutische Fabrik Dr. Hubold and Bartsch.) June 24, 1937. 495,892.

MANUFACTURE OF PICRYL COMPOUNDS and conversion products thereof.—Sir G. T. Morgan, and J. Stewart. July 3, 1937. 496,258.

DECOMPOSITION OF PHOSPHATES.—G. W. Johnson (I. G. Farbenindustrie.) Aug. 4, 1937. 496,078.

MANUFACTURE AND PRODUCTION OF ALKYL CHLORIDE.—G. W. Johnson (I. G. Farbenindustrie.) Aug. 11, 1937. 495,900.

PRODUCTION OF CELLULOSE NITRATE from regenerated cellulose. M. F. Monbiot. Oct. 12, 1937. 495,908.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. Nov. 16, 1936. 495,914.

ALKANOL-AMINE SALTS of mandelic acid and process for producing them.—E. Lilly and Co. June 24, 1937. 496,004.

MANUFACTURE OF PLASTIC DISPERSIONS of the water-in-oil type. H. Schou. Jan. 4, 1938. 496,166.

RECOVERY OF AROMATIC HYDROCARBONS and phenols.—I. G. Farbenindustrie. Jan. 18, 1937. 495,924.

MANUFACTURE OF DISTEMPERS, washes, and the like.—P. Sheel. Feb. 28, 1938. 496,171.

DISTILLATION OF HIGH BOILING LIQUIDS such as fatty acids.—Colgate-Palmolive-Peet Co. June 11, 1936. 496,175.

ELECTROLYTIC PURIFICATION OF ALUMINIUM.—Aluminium-Industrie, A.-G. June 3, 1937. 496,028.

MANUFACTURE OF CATALYSTS.—W. P. Williams (Procter and Gamble Co.). Jan. 28, 1938. 496,199.

PREHEATING OF THE INITIAL MATERIALS in the destructive hydrogenation of bituminous coal.—H. E. Potts (Naamlooze Vennootschap Internationale Hydrogeneeringsoctrooien Maatschappij (International Hydrogenation Patents Co.). July 25, 1938. 495,954.

HYDROGENATION OF ALKYLENE OXIDES.—Usines de Melle, and H. M. E. Guinot. March 25, 1937. (Convention date not granted.) 496,264.

Chemical and Allied Stocks and Shares

ALTHOUGH holiday influences made for a further reduction of business in most sections of the Stock Exchange, sentiment was less inclined to be influenced by international political affairs. Following the statement made by the Chancellor of the Exchequer regarding the trade position, industrial securities became a firmer market and in some directions moved in favour of holders.

Securities of companies identified with the chemical and allied trades benefited from the slight improvement in market conditions. Imperial Chemical are 30s. 7½d. at the time of writing, compared with 30s. 1½d. a week ago, while Turner and Newall improved from 77s. 6d. to 78s. 6d., the last named being influenced by hopes that the dividend may be maintained. Lever and Unilever at 36s. 9d. are within 3d. of the price ruling a week ago, while United Molasses have rallied from 20s. 9d. to 21s. 3d.

Cement shares remained out of favour and Associated Cement are 68s. 9d., which compares with 71s. 3d. a week ago. British Plaster Board were relatively steady around 27s. 3d., a decline of 6d. on balance. Wall Paper deferred went back rather sharply but later showed a partial recovery to 33s. Pinchin Johnson, International Paint and various other paint shares regained part of the declines shown at the beginning of the week, Wailes Dove Bitumastic were steady, aided by the maintenance of the dividend.

More attention attached to shares of steel producers, including United Steel, Dorman Long, Baldwins and Guest Keen, which were responsive to the view that the reduction in steel prices will increase the turnover of these companies a good deal next year if trade conditions are active. Tube Investments, Babcock and Wilcox and shares of other large users of steel also showed a better trend.

Courtaulds rallied moderately, but British Celanese and most other textile shares were dull and showed only small movements. Imperial Smelting at 10s. 9d. are within 3d. of the price ruling a week ago, and Borax Consolidated reacted to 26s. 6d. Birmid Industries were fairly steady, and some buying of Delta Metal and Beans Industries shares was reported on market talk of a possible increase in dividends. Boots Drug were again a relatively steady feature and movements did not exceed a few pence. At the time of writing the price is 39s. 3d., which compares with 40s. a week ago. Timothy Whites and Taylors regained an earlier decline and at 23s. 6d. are unchanged on balance, while Sangers were steady at 22s., aided by the maintenance of the interim dividend.

Triplex Glass ordinary units continued to fluctuate sharply, while Lancegaye Glass were lower on the decision not to pay an interim dividend. In other directions most shares with an international market became steadier and moderate rises were recorded by International Nickel and Swedish Match. Oil shares showed a better tendency and higher prices obtained for Anglo-Iranian and Burmah Oil. "Shell" and Royal Dutch also made some improvement, although the disposition is to await the interim dividend announcements of these two companies which fall to be declared next month.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

UNOPOL PRODUCTS, LTD., Chertsey, polish manufacturers, (M., 17/12/38.) Nov. 22, series of £500 debentures, present issue £400; general charge.

W. G. BOWMAR AND CO., LTD., Leicester, dyers and bleachers. (M., 17/12/38.) Dec. 1, charge, to Westminster Bank, Ltd., securing all moneys due or to become due to the Bank; charged on The Bleach Works, Bowmars Lane, Frog Island, Leicester, etc. *Nil. Feb. 8, 1938.

WYROVOYS PRODUCTS, LTD., London, W., hair dye manufacturers. (M., 17/12/38.) Dec. 2, £2,000 debenture, to A. M. Dyer, London, and others; general charge.

Satisfaction

PREMIER DRUG CO., LTD., Manchester. (M.S., 17/12/38.) Satisfaction December 2, of charge registered April 15, 1933.

County Court Judgments

GALLOWAY, FREDERIC, 42 West Cromwell Road, Earls Court, manufacturing chemist. (C.C., 17/12/38.) £40 18s. 6d. October 17.

KAULVERS (H.) MANUFACTURING CO. (firm), 1 Lavers Road, Stoke Newington, manufacturing chemist. (C.C., 17/12/38.) £11 13s. 6d. November 1.

Declaration of Solvency Filed

GUISELEY SILICA CO., LTD., Kidderminster. (D.S.F., 17/12/38.) December 6.

Receiverships

ARDAL, LTD., Weston-super-Mare, metal refiners. (R., 17/12/38.) A. Collins, 28 Baldwin Street, Bristol, has been appointed receiver and manager. December 2.

BASSETT AND ROBERTS, LTD., London, E.C., oil refiners and distributors. (R., 17/12/38.) P. N. Goode, 34 Grimsdyke Road, Hatch End, has been appointed receiver and manager. November 17 and 18.

NEW PROCESS CO., LTD., Southall, manufacturing chemists. (R., 17/12/38.) H. J. B. Feist, has ceased to act as receiver and manager. November 24.

Bankruptcy Proceedings

WOODS, RICHARD EDWARD, 16 Belsize Crescent, Hampstead, Middlesex, who carries on business at 25 Victoria Street, Westminster. (B.P., 17/12/38.) Manufacturing chemist. Proceeding with examination, Dec. 20, 11 a.m. Bankruptcy Buildings, Carey Street, London, W.C.2.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Argentina and Uruguay.—A well-established agent at Buenos Aires wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemical products and drugs for Argentina and Uruguay. (Ref. No. 434.)

Books Received

Vitamine und Hormone. Dr. Hellmut Bredereck and Dr. Robert Mittag. Leipzig: Verlag Von S. Hirzel. Pp. 138. RM. 7.

Laboratory Methods of Biochemistry. By A. Bertho and W. Grassmann, trans. by W. McCartney. London: Macmillan and Co., Ltd. Pp. 271. 18s.

Laboratory Manual of Organic Chemistry. By Harry L. Fisher. 4th Edition. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. Pp. 412. 13s. 6d.

Second Year College Chemistry. By William H. Chaplin. 4th Edition. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. Pp. 407. 9s. 6d.

Company News

George Kent, Ltd., have declared an interim dividend of 3 per cent., less tax (same).

Cement, Ltd. (which was incorporated in Eire in 1936) have declared a maiden distribution of 4 per cent.

Anglo-Alpha Cement have declared a final dividend of 5 per cent., making 10 per cent. for the year (5 per cent.).

Pharmaceutical Products, Ltd., have declared a half-yearly dividend on 6½ per cent. guaranteed redeemable preference shares, on January 1.

Lancegaye Safety Glass (1934), Ltd., have decided to conserve financial resources and pass the interim dividend, which last year was 7 per cent.

The Wailes Dove Bitumastic Co., Ltd., have declared a dividend of 7½ per cent., making a total of 12½ (the same). The profit for the year was £30,088 (£25,963).

International Combustion, Ltd., have declared a final dividend of 12½ per cent., less tax, making 32½ per cent., payable February 9 (30 per cent.), transferred to reserve, £50,000 (same).

Powell Duffryn Associated Collieries, Ltd., have announced that the dividend on the 4¾ per cent. cumulative preference stock for the half-year ended December 31, will be paid on January 21.

Manbré and Garton, Ltd., for the year ended September 30, show a profit of £410,648 (£407,982); to general reserve, £25,000; to special reserve, £15,000; to pensions reserve, £5,000; carried forward, £233,484 (£230,516).

Maclean's, Ltd., have declared an interim dividend of 10 per cent., less tax, on the ordinary shares. A similar interim paid at this time last year was followed by a final of 20 per cent., making 30 per cent., less tax.

Beechams Pills, Ltd., have declared a second interim dividend on the deferred shares of 6¾ per cent., less tax, payable December 20, which is equivalent to the rate of 20 per cent., less tax, declared in December, 1937.

Milton Proprietary, Ltd., report for the year ended September 30, profits of £29,081 (£46,735), reserve for taxation, £2,500 (£6,000), final of 12½ per cent., making 20 per cent. (25 per cent.); forward, £69,889 (£67,375).

Turner & Newall, Ltd., report for the year ended September 30, an increase in trading profits of from £1,333,489 to £1,361,694. A final dividend of 16¼ per cent., less tax, has been declared, which, with the interim of 3¾ per cent. already paid, makes the year's total 20 per cent. (same).

The Bowater's Group.—Bowater's Paper Mills, Ltd., report trading profits to September 30 of £202,478 (£263,897), Bowaters and Lloyds Sales Co., Ltd., profits of £106,901 (£97,569), Bowater's Mersey Paper Mills profits of £124,962 (£159,855), Edward Lloyd, Ltd., profits of £371,833 (£303,077 for previous nine months) and Edward Lloyd Investment Co., a net revenue of £73,097 (£58,228).

Duffield Coal Products, Ltd., for the year to September 30, report a loss of £1,846. The debit balance carried forward is increased to £37,385. The meeting is on December 19. It is stated that the year's work has been applied to the practical consideration arising from the company's successful research on the production of methyl alcohol as a motor spirit from coal. The company, with the assistance of makers of specialised plant, has now established concrete means by which extensive production of this spirit from coal can be effected at the low cost of 3d. a gallon.

New Companies Registered

Fisolene Company of Great Britain, Ltd. 20,664 (Scotland).—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on the business of oil, grease, paint and chemical manufacturers, agents and importers, chemists, druggists and drysalters, etc. Directors: Wilfred A. Henderson, Greitenden, Drymen, Stirlingshire; Charles R. M. Holt, John G. Primrose. Registered office: 136 Buchanan Street, Glasgow, C.1.

British Medica Laboratories, Ltd. 346,293.—Private company. Capital, £12,500 in 7,500 ordinary and 5,000 "A" ordinary shares of £1 each. To acquire the business of manufacturing chemists now carried on by British Medica Laboratories at 225 Archway Road, Highgate. Subscribers: D. Delaney, 225 Archway Road, Highgate, N.6; C. W. S. Temple. Registered office: 225 Archway Road, Highgate, N.6.

Deason Chemical Company (1938), Ltd. 346,430.—Private company. Capital £5,000 in 5,000 shares of £1 each. To adopt an agreement with Chas. O. Tiley, the liquidator of the Deason Chemical Company, Ltd., for the acquisition of the undertaking, property and assets and all the debts, liabilities and engagements of the said company, and to carry on the business of manufacturing and dispensing chemists and druggists, etc. Directors: Derek Ainley, 13 Swaledale Gardens, Newcastle-on-Tyne; Gordon Raine, Thos. J. Winning.

Weekly Prices of British Chemical Products

WITH the approach of the end of the year period a quiet tone prevails in most sections of the market. In regard to heavy chemicals interest is chiefly displayed in contract renewals and forward bookings over the next twelve months. So far there have been very few alterations in contract rates and in most cases forward bookings are being accepted at prevailing quotations. It is now reported that the existing rebates for bulk quantities of sodium and potassium dichromate are to be continued with the exception of the discount in operation during 1938 for foreign material. Apart from a reduction of 4d. per lb. in the home makers' price for aspirin there are no important price changes to record and values in nearly all sections of the market are on a steady basis. Conditions in the market for coal tar products continue more or less as reported last week with quotations on a nominal basis.

Price Changes

Rises: Copper Sulphate (Manchester); Calcium Acetate, grey (Manchester).

Falls: Cadmium Sulphide; Wood Naphtha, solvent.

MANCHESTER.—End-of-the-year influences are making themselves increasingly felt on the Manchester chemical market. During the past week there have been further moderate additions to order books for contract deliveries over varying periods of next year and, on the whole, the position compares fairly well in this respect with that at the corresponding date of last year, although the volume of business placed has probably been somewhat smaller. Otherwise the market at the present time is rather quiet, with a moderate general movement of supplies into consumption. Stock taking operations, however, are likely to have a limiting effect on contract deliveries until after the turn of the year.

GLASGOW.—Business in general chemicals has continued on a rather quiet scale during the week, both for home trade and export.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 7s. 6d. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.), 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip), 7s.; levig., 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¼d. to 10¼d. per lb. SCOTLAND: B.P. Crystals, 10¼d. MANCHESTER: B.P. 9¼d. to 11¼d.

POTASSIUM PRUSSIATE.—5¼d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

Soda, Caustic.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. Scotland: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£19-£20 per ton carriage paid North. Glasgow: £18 10s. per ton net ex store.

Sodium Bicarbonate.—Refined spot, £10 15s. per ton d/d station in bags. Glasgow: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. Manchester: £10 15s.

Sodium Bisulphite Powder.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£27 10s. to £32 per ton. Glasgow: £1 11s. per cwt., minimum 3 cwt. lots.

Sodium Dichromate.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

Sodium Chromate.—4½d. per lb. d/d U.K.
4d. per lb. Glasgow: 4½d. net, carriage paid.

Sodium Hyposulphite.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. Manchester: Commercial, £11; photographic, £15 10s.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £8 per ton for 6-ton lots d/d. Glasgow: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

Sodium Nitrite.—£18 5s. per ton for ton lots.

Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

Sodium Prussiate.—'d. per lb. for ton lots. Glasgow: 5d. to 5¾d. ex store. Manchester: 4¼d. to 5d.

Sodium Silicate.—£8 2s. 6d. per ton.

Sodium Sulphate (Glauber Salts).—£3 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. Scotland: Ground quality, £3 5s. per ton d/d. Manchester: £3 12s. 6d.

Sodium Sulphide.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. Manchester: Concentrated solid, 60/62%, £11; commercial, £8 10s.

Sodium Sulphite.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Sulphuric Acid.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

Tartaric Acid.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. Manchester: 1s. 1¼d. per lb. Glasgow: 1s. 1¼d. per lb., 5%, ex store.

Zinc Sulphate.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.

Barytes.—£6 to £6 10s. per ton, according to quality.

Cadmium Sulphide.—3s. 1d. to 3s. 4d. per lb.

Carbon Black.—3⅜d. to 4 1/16d. per lb., ex store.

Carbon Disulphide.—£31 to £33 per ton, according to quantity, drums extra.

Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.

Chromium Oxide.—Green, 10½d. to 11½d. per lb.

Diphenylguanidine.—2s. 2d. per lb.

India-rubber Substitutes.—White, 4½d. to 5½d. per lb.; dark 3½d. to 4½d. per lb.

Lamp Black.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

Lead Hyposulphite.—9d. per lb.

Lithopone.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

Sulphur.—£9 to £9 5s. per ton. Sulphur precip. B.P., £55 to £60 per ton. Sulphur precip. comm., £50 to £55 per ton.

Sulphur Chloride.—5d. to 7d. per lb., according to quantity.

Vermilion.—Pale, or deep, 5s. per lb., 1-cwt. lots.

Zinc Sulphide.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

Ammonium Sulphate.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

Nitro Chalk.—£7 10s. 6d. per ton up to June 30, 1939.

Sodium Nitrate.—£8 per ton for delivery up to June 30, 1939.

Concentrated Complete Fertilisers.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

Ammonium Phosphate Fertilisers.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. Glasgow: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. Manchester: Pure, 1s. 8d. per gal.; crude, 11½d. per gal.

Carbolic Acid.—Crystals, 6⅝d. to 7⅞d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10½d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

Creosote.—Home trade, 3¾d. to 4d. per gal., f.o.r. makers' works; exports 6d. to 6¼d. per gal., according to grade. Manchester: 3¾d. to 4¼d. Glasgow: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5¼d.; lower sp. gr. oils, 5¾d. to 6¼d.

Cresylic Acid.—97/99%, 1s. 8d. to 1s. 11d.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 1s. 10d. to 2s.; Dark, 95%, 1s. 5d. to 1s. 6d. per gal. Glasgow: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. Manchester: Pale, 99/100%, 1s. 9d.

Naphtha.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. Glasgow: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

Naphthalene.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £11 per ton in 2-cwt. bags. London: Fire lighter quality, £3 to £4 10s. per ton. Glasgow: Fire lighter, crude, £6 to £7 per ton (bags free). Manchester: Refined, £12 to £13 per ton f.o.b.

Pitch.—Medium, soft, 30s. per ton, f.o.b. Manchester: 30s. f.o.b., East Coast. Glasgow: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

Pyridine.—90/140%, 12s. to 14s. per gal.; 90/160%, 9s. 8d. to 10s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. Glasgow: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. Manchester: 11s. to 14s. per gallon.

Toluol.—90%, 1s. 11d. per gal.; pure 2s. 3d. Glasgow: 90% 120, 1s. 10d. to 2s. 1d. per gal. Manchester: Pure, 2s. 3d. to 2s. 4d. per gallon, naked.

Xylol.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s 3½d. Glasgow: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £6 15s. to £9 5s. per ton; grey, £8 5s. to £8 10s. Manchester: Brown, £8 10s.; grey, £10.

Methyl Acetone.—40.50%, £32 to £35 per ton.

Wood Creosote.—Unrefined, 6d. to 8d. per gal., according to boiling range.

Wood Naphtha, Miscible.—2s. 8d. to 3s. per gal.; solvent, 3s. to 3s. 3d. per gal.

Wood Tar.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.

Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.

Benzidine, HCl.—2s. 7½d. per lb., 100% as base, in casks.

Benzoic Acid, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

***m*-Cresol 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.

***o*-Cresol 30/31° C.**—6½d. to 7½d. per lb. in 1-ton lots.

***p*-Cresol, 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.

Dichloraniline.—2s. 1½d. to 2s. 5d. per lb.

Dimethylaniline.—Spot, 1s. 7½d. per lb., package extra.

Dinitrobenzene.—7½d. per lb.

Dinitrochlorbenzene, Solid.—£79 5s. per ton.

Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

Diphenylamine.—Spot, 2s. 2d. per lb., d/d buyer's works.

Gamma Acid, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H Acid.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

Naphthionic Acid.—1s. 10d. per lb.

***β*-Naphthol** —£97 per ton; flake, £94 8s. per ton.

***α*-Naphthylamine.**—Lumps, 1s. 1d. per lb.

***β*-Naphthylamine.**—Spot, 3s. per lb.; d/d buyer's works.

Neville and Winther's Acid.—Spot, 3s. 3½d. per lb. 100%.

***o*-Nitraniline.**—4s. 3½d per lb.

***m*-Nitraniline.**—Spot, 2s. 10d. per lb. d/d buyer's works.

***p*-Nitraniline.**—Spot, 1s. 10d. to 2s. 1d. per lb. d/d buyer's works.

Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

Nitronaphthalene.—9½d. per lb.; P.G., 1s. 0½d. per lb.

Sodium Naphthionate.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

Sulphanilic Acid.—Spot, 8½d. per lb. 100%, d/d buyer's works.

***o*-Toluidine.**—10½d. per lb., in 8/10 cwt. drums, drums extra.

***p*-Toluidine.**—1s. 10½d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 3d. per lb., 100%.

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CLASSIFIED SECTION

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